Prepared for
VHM Limited
ABN: 58 601 004 102

EPA Development Licence Application APP026623 Supporting Document

Goschen Mineral Sands and Rare Earths Project

21-Aug-2023
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ABN: 58 601 004 102

Prepared by

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Acronym List

Term	Description
AEP	Annual Exceedance Probability
AS/NZS	Australian and New Zealand standards
BaP	Benzo(a)pyrene
BATT	Best available techniques and technologies
BTEX	Benzene, toluene, ethylbenzene and xylenes
CAGR	Compound annual growth rate
CEMP	Construction Environmental Management Plan
CHMP	Cultural Heritage Management Plan
CO	Carbon monoxide
CO_2	Carbon dioxide
CMA	Catchment Management Authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
dB	Decibels
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEECA	Department of Energy, Environment and Climate Action
DG	Dangerous goods
DHHS	Department of Health and Human Services
DJSIR	Department Jobs, Skills, Industry and Regions
DL	Development Licence
DoT	Department of Transport
DTP	Department of Transport and Planning
EES	Environment Effects Statement
EPA Victoria	Environment Protection Authority Victoria
EPBC	Environment Protection and Biodiversity Conservation
ERR	Earth Resources Regulation
ERS	Environment Reference Standard
EV	Electric vehicle
FFG Act	Flora Fauna Guarantee Act
FPP	Feed preparation plant
ft	Feet
FZ	Farming zone
G/kWh	Grams per kilowatt hour
g/s	Grams per second
GDE	Groundwater dependent ecosystems
GED	General Environmental Duty

Term	Description
GL	Gigalitres
GMW	Goulburn Murray Water
HAL	Hot acid leach
HiTi	High titanium
HMC	Heavy mineral concentrate
HMP	Hydrometallurgical plant
HSEMS	Health Safety and Environment Management System
IEA	International Energy Agency
ISO	International Organisation for Standardisation
kL	Kilolitre
km	Kilometre
kV	Kilovolt
kW	Kilowatt
L/day	Litres per day
L/h	Litres per hour
Leq	Equivalent continuous sound level
LNG	Liquefied natural gas
LV	Low voltage
m	Metre
m/s	Metres per second
m bgl	Metres below ground level
MCC	Motor control centre
mg/L	Milligrams per litre
MIN	Mining licence
ML	Megalitres
MNES	Matters of National Environmental Significance
MSP	Mineral separation plant
Mtpa	Million tonnes per annum
MUP	Mining unit plant
MW	Megawatt
NATA	National Association of Testing Authorities
NHVR	National Heavy Vehicle Regulator
NO_2	Nitrogen dioxide
NOx	Oxides of nitrogen
OEMP	Operational Environmental Management Plan
OL	Operating Licence
PAH	Polycyclic aromatic hydrocarbons

Term	Description
PM	Particulate matter
PSA	Planning Scheme Amendment
RCP	Representative Concentration Pathway
REMC	Rare earth mineral concentrate
ROM	Run of mine
SCADA	Supervisory Control and Data Acquisition
SCO	Specific Controls Overlay
SO_2	Sulfur dioxide
TDS	Total dissolved solids
TRG	Technical Reference Group
TSP	Total suspended particles
µm	Micro grams per cubic metre
µm	Micrometres
VHM	VHM Limited
VOC	Volatile organic compounds
WCP	Wet concentrator plant

1. Primary information

1.1. Introduction

This document is a supporting document to the online submission on behalf of VHM Limited (VHM) to the Environment Protection Authority Victoria (EPA) for a Development Licence (DL) under Section 44 of the *Environment Protection Act 2017 (Vic)* ('EP Act') for treatment of sewage and generation of power as part of the Goschen Mineral Sands and Rare Earths Project (the Project).

VHM is proposing to develop the Project in the Loddon Mallee Region of Victoria, approximately 35 km south of Swan Hill. The Project would involve the mining and processing of heavy mineral sands and rare earths at a throughput of approximately 5 million tonnes per annum (Mtpa) with the production of mixed heavy mineral concentrate (HMC), zircon concentrate, rutile product, leucoxene products, ilmenite product and rare earth mineral products, over a 20 to 25 year mine life. Mine products are proposed to be transported via road and rail for export overseas. Further information is presented in Section 2.

This DL application relates solely to the proposed sewage treatment and power generation activities. In accordance with Section 45 of the EP Act, an EPA Operating Licence (OL) will be required prior to commencing Project operations.

EPA Publication 2011: Development licence application guidance (EPA 2021) identifies the information required as follows:

- Primary Information
  - Company legal entity (Section 1.2)
  - Application fee (Section 1.3)
- Land use:
  - Planning and other approvals (Section 3)
  - Choice of location for an activity (Section 2.1.1.1)
- Track record (Section 4)
- Community and third-party engagement (Section 5)
- Evidence supporting compliance with the obligations of the EP Act and Environment Protection Regulations 2021 (Environment Protection Regulations):
  - Demonstrate compliance with the General Environmental Duty (GED) (Section 7)
  - Demonstration of reduction of risk(s) to human health and the environment, so far as reasonably practicable (Section 7)
  - Demonstrate compliance with the eleven principles of the EP Act (Section 6.1)
  - Best available techniques and technologies (BATT): Demonstrate proposed techniques and technologies are compliant with relevant duties so far as is reasonably practicable (Section 7 and Section 8)
  - Demonstrate the activity is consistent with the requirements of the EP Act
  - Details of proposed measures to comply with all relevant applicable duties, including waste duties, other than the GED (Section 7)
- Prescribed matter(s):
  - identify and address any other requirements in the Environment Protection Regulations or subsidiary legislation related to the specified development activity

An Environment Effects Statement (EES) has been prepared for the Project under the *Environment Effects Act 1978 (Vic)*. The EES has been prepared in accordance with the scoping requirements and relevant legislation, policy and guidelines and has been informed by the environmental impact

assessments and specialist studies completed for the EES. This DL application has been informed by the EES and the supporting specialist studies prepared for the Project.

1.2. Company legal entity

VHM Limited (VHM) company details are provided in Table 1 below.

Table 1 VHM Company Details

	Details
Company Name	VHM Limited (VHM)
ACN	601 004 102
ABN	58 601 004 102
Registered Address	Level 1, Suite 6, 389 Oxford Street, Mt Hawthorn, Western Australia, 6016
ASIC Extract	Provided in Appendix A
CEO	Graham Howard Managing Director +61 439 696 106 Graham.howard@vhmltd.com.au
Application contact	Kurtis Noyce Environment and Approvals Specialist +61 458 600 045 Kurtis.noyce@vhmltd.com.au
Email address for billing	accountspayable@vhmltd.com.au

1.3. Application fee

An application fee must be paid when submitting a development licence application. The application fee is prescribed in Section 172 of the Environment Protection Regulations 2021, being the greater of:

- 1 per cent of the estimated cost of the prescribed development activity. This is capped at 4,500 fee units; or
- 81.83 fee units which equates to $1,251.18.

The maximum fee payable is 4,500 fee units which equates to $68,805.00.

The estimated cost of the power station and sewage treatment plant is $6,399,999. As such we estimate the application fee to be $63,999.99.

1.4. Need for Development Licence

Under the EP Act to perform prescribed activities that may cause harm, a permission such as a licence, permit or registration must be obtained. A licence is required for a prescribed activity requiring the highest level of regulatory control within the EPA permission scheme. This is due to the potential high risk of harm to human health and the environment. Schedule 1 of the Environment Protection Regulations sets out prescribed permission activities.

Operation of the Goschen Mineral Sands and Rare Earths Project (the Project) would include sewage treatment and operation of a power station. This DL application applies to these activities, constituting activity type A03 (Sewage treatment) and K01 (Power generation).

Each activity requiring a DL would be located within the process plant area of the Project and therefore the boundary of this DL would be restricted to this area. The process plant would be located within Project Area 1 as presented in Figure 1 below. A layout of the process plant is presented in Figure 2.

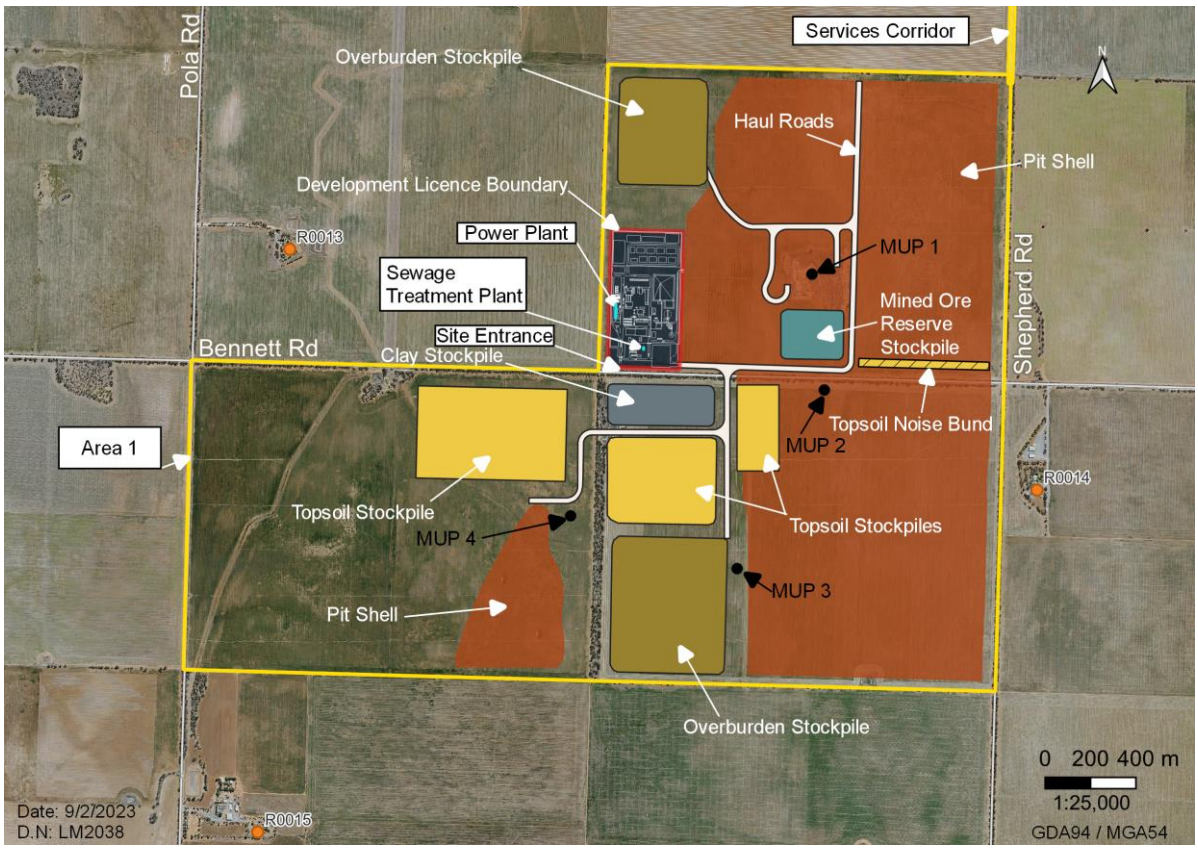

Figure 1 Development licence boundary

Figure 2 Process plant layout

A separate permission will be prepared for the disposal of tailings in-pit during mining operations. This activity is not covered by this DL and is deemed to require an A18 (Discharge or deposit of waste to aquifer) permit given that deposited tailings would discharge water that would infiltrate the local groundwater aquifer.

1.4.1. Waste treatment, disposal, transport and recycling: A03 – Sewage treatment

The prescribed permission activity A03 (Sewage treatment) is described as: Treating, discharging or depositing sewage (including sullage), exceeding a design or actual flow rate of 5,000 litres per day on any day.

An on-site sewage treatment plant would be needed to support approximately 100 workers per 12 hour shift during operations. The sewage treatment plant would treat effluent from on-site ablutions (showers and toilets) to a standard similar to Class C recycled water. As such, the sewage treatment plant would have a maximum capacity of up to 20,000 litres per day and would require a DL under the EP Act.

1.4.2. Utilities: K01 – Power generation

The prescribed permission activity K01 (Power generation) is described as: Generating electrical power from the consumption of a fuel at a rated capacity of at least 5 megawatts (MW) of electrical power.

It is proposed that the Project would require a standalone 12-megawatt (MW) dual fuel (diesel/liquified natural gas) power station, triggering the threshold for a DL. The 12 MW power station would comprise 12 duty and two standby 0.85 MW dual fuel generators. To achieve the power requirements, the 12 duty diesel generators would target operating between 70-90% of full load for optimal efficiency.

2. Project overview

This DL application relates solely to the sewage treatment and power generation activities that would occur as part of mining operations at the Project.

2.1. Project background

The Goschen Mineral Sands and Rare Earths Project (the Project) would involve the mining and processing of heavy mineral sands and rare earths at a throughput of approximately 5 million tonnes per annum (Mtpa) and the production of mixed heavy mineral concentrate (HMC), zircon concentrate, rutile product, leucoxene products, ilmenite product and rare earth mineral products, over an approximate 20 to 25 year mine life. Mine products are proposed to be transported via road and rail for export overseas.

VHM Limited (VHM) would implement the mine development in phases. Phase 1 would involve a mining unit plant (MUP), wet concentrator plant (WCP), feed preparation plant (FPP) and a rare earth mineral concentrate (REMC) flotation plant. The product suite for Phase 1 consists of zircon. titania heavy mineral concentrate (HMC) and REMC products. Phase 1A would add a hydrometallurgical plant (HMP) downstream of the REMC flotation plant. The HMP would commence operations approximately 18 months post first production. The product suite for Phase 1A consists of mixed rare earth carbonate (MREC) products and zircon/ titania HMC.

Phase 2 would commence approximately 24 months post first production and, subject to prevailing market circumstances, consist of an additional mineral separation plant (MSP), hot acid leach (HAL) and chrome removal circuit. The additional plant would allow for the production of premium zircon, zircon concentrate, high titanium (HiTi) rutile, HiTi leucoxene and low chromium ilmenite.

2.1.1. Project setting

The Project would be located within the Avoca Ward of Gannawarra Shire Council, just south of the municipality's boundary with Swan Hill Rural City Council. The proposed mine site would be situated on the farmlands and paddocks between Donald-Swan Hill Road, west of the Project, and Quambatook-Swan Hill Road, east of Project site. North of the Project would be Mystic Park-Meatian Road and south of the Project would be Lalbert-Kerang Road (refer to Figure 3).

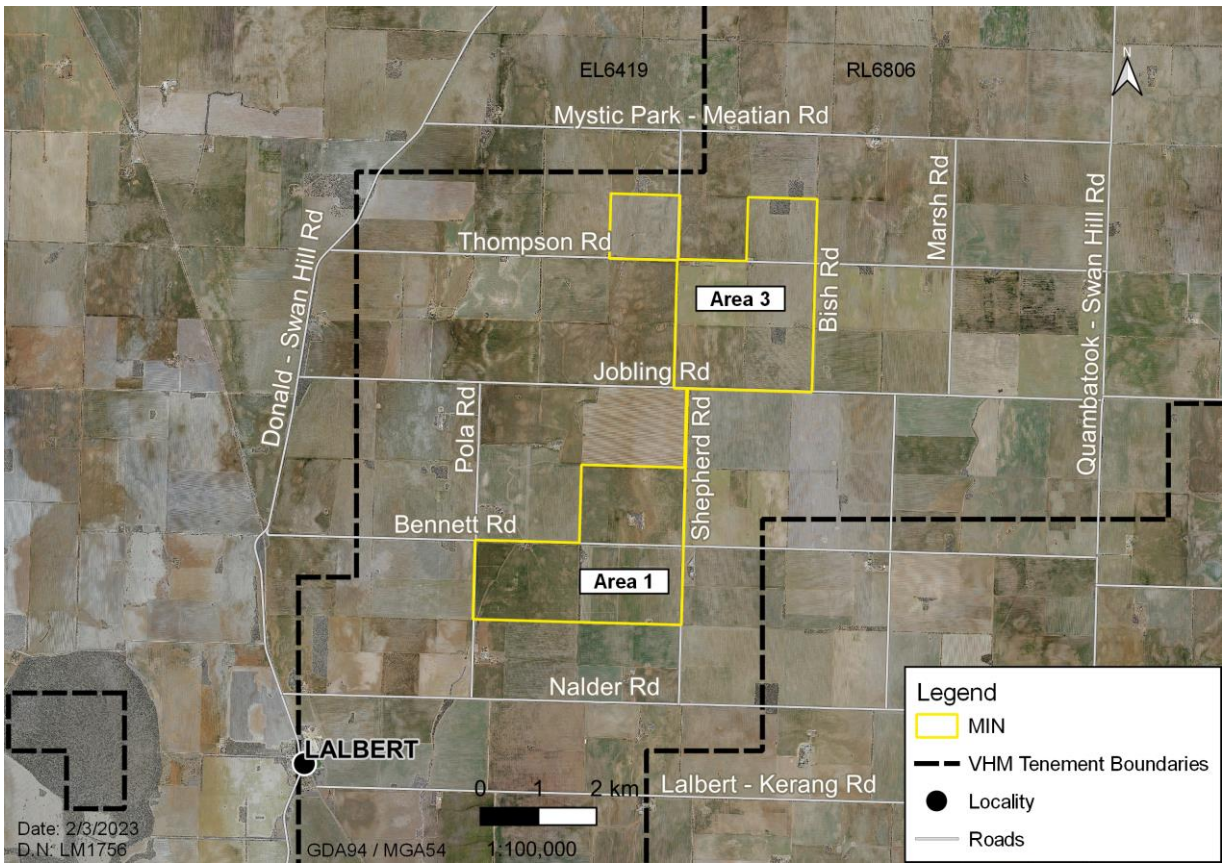

Figure 3 Project footprint

Gannawarra Shire Council has an area of 3,725 square kilometres and is located approximately 20 km south of Swan Hill. The municipality is located within the Loddon Mallee Region, in the northwest of Victoria. It borders New South Wales (NSW) along its north-eastern border and is surrounded by the municipalities of Swan Hill Rural City Council, Buloke Shire, Loddon Shire and Campaspe Shire. The municipality contains the regional centre of Kerang and the small towns of Murrabit, Mystic Park, Lake Charm, Lalbert, Quambatook, Macorna, Leitchville, Cohuna and Koondrook. The closest town to the Project mine site is Lalbert, which is approximately 3 kilometres southwest. The water pipeline also runs through the town of Mystic Park.

Swan Hill Rural City Council covers 6,116 square kilometres and sits just north of the Gannawarra Shire Council. The Project mining areas and pipeline extends beyond the Gannawarra Shire municipal boundary into the municipality of Swan Hill Rural City. Towns of note located close to the Project are Swan Hill, Lake Boga and Ultima.

The populations of both Gannawarra Shire and Swan Hill Rural City Council have remained constant over the past 10 years. However, a review of key policy documents has made it evident that there is a consistent flow of people moving away from the smaller towns into the regional centres such as Kerang, Swan Hill and around the Kerang Lakes.

Natural assets in the region include the Murray River, Gunbower National Park and the Kerang Lakes Ramsar site. There are also several smaller creeks and waterways that feed wetlands and lagoons among the Redgum forests, Black Box swamps and floodplains.

The Kerang Lakes comprises 23 lakes, swamps and waterways of varying size, permanence, depth, salinity and vegetation type. They are a designated Ramsar wetlands and includes wetland types such as permanent open freshwater, deep freshwater marshes, tree-dominated wetlands, and permanent and semi-permanent saline wetlands. The Kerang Lakes are part of the Murray-Darling drainage basin and sit on the floodplains associated with the Murray, Avoca and Loddon Rivers.

The broader region is managed by the North Central Catchment Management Authority (NCCMA) and water volumes of many of the lakes, such as Kangaroo Lake, are managed by Goulburn Murray Water

(GMW), which use the lakes as part of the irrigation distribution system for the Torrumbarry Irrigation Area.

Kangaroo Lake, part of the Kerang Lakes Ramsar site, is well known for fishing and water sports. The north end of the lake is popular for day visitors and contains a caravan park on the lake foreshore. Land along the south-west bank of the lake (south of Kangaroo Lake Road) also has high amenity and recreational value. It contains several residences and is used for water sports, fishing and swimming.

In addition to the Lake's recreational value, water from Kangaroo Lake is a key resource to surrounding agricultural land and many sections of its banks are characterised by water channel and pumping infrastructure that facilitates the distribution of water to agricultural land in the broader region.

The most common current land use surrounding the Project is broadacre cropping. Project mining Area 1 and 3 would be situated entirely on land within a Farming Zone (FZ) under the provisions of the Gannawarra Planning Scheme. There are no planning overlays across the Project area.

Sewage treatment and power generation activities would be located within the process plant in mining Area 1 (refer to Figure 11).

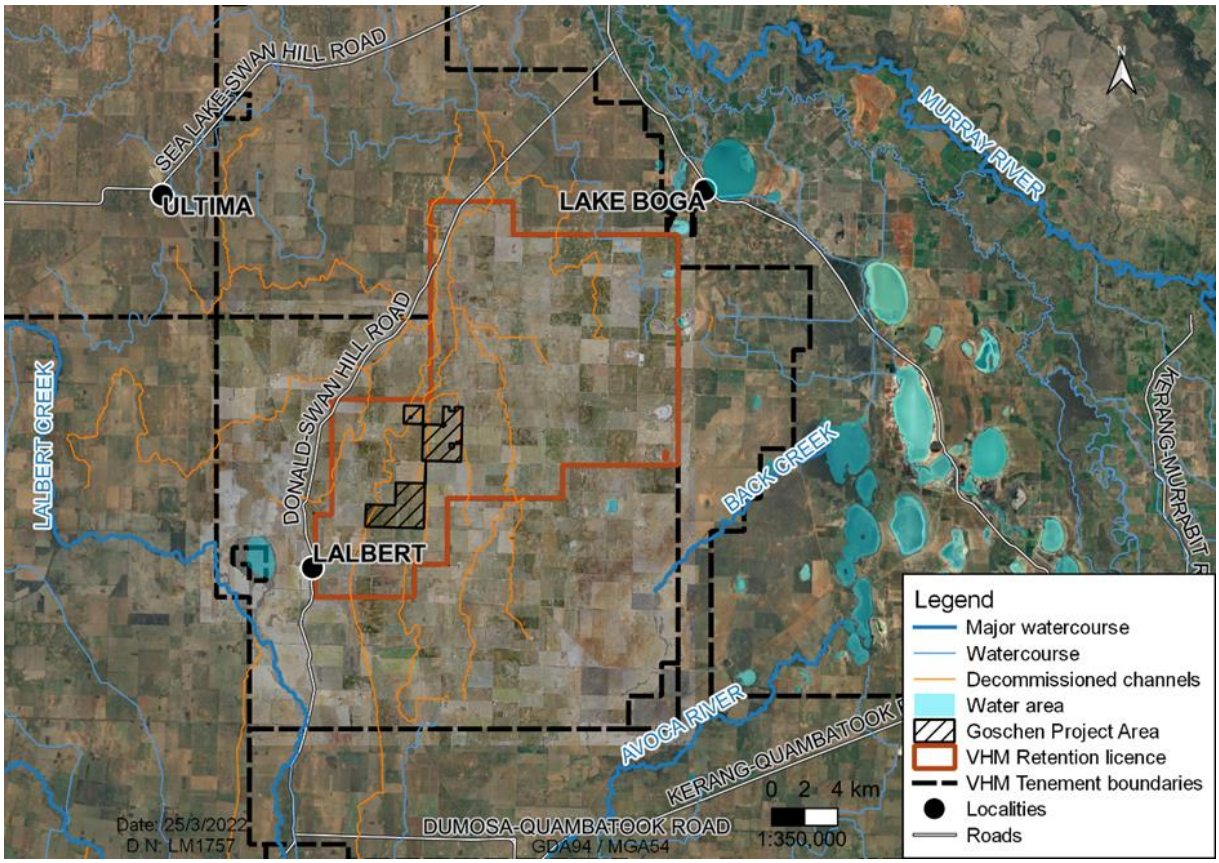

Figure 4 Surrounding watercourses

2.1.1.1. Choice of location for the activity

VHM hold over 2,860 km^2 of near-contiguous tenements in Victoria. This has provided VHM with access to significant historical exploration data, which formed the basis of VHM's exploration program to generate its own data for estimating mineral resources and ore reserve estimates within its tenements. The exploration undertaken to date has discovered one of the world's largest, highest-grade zircon, rutile and rare earth mineral deposits, comprising an ore reserve of 300 million tonnes, located near Lalbert in the Murray Basin, Victoria (refer to Figure 5).

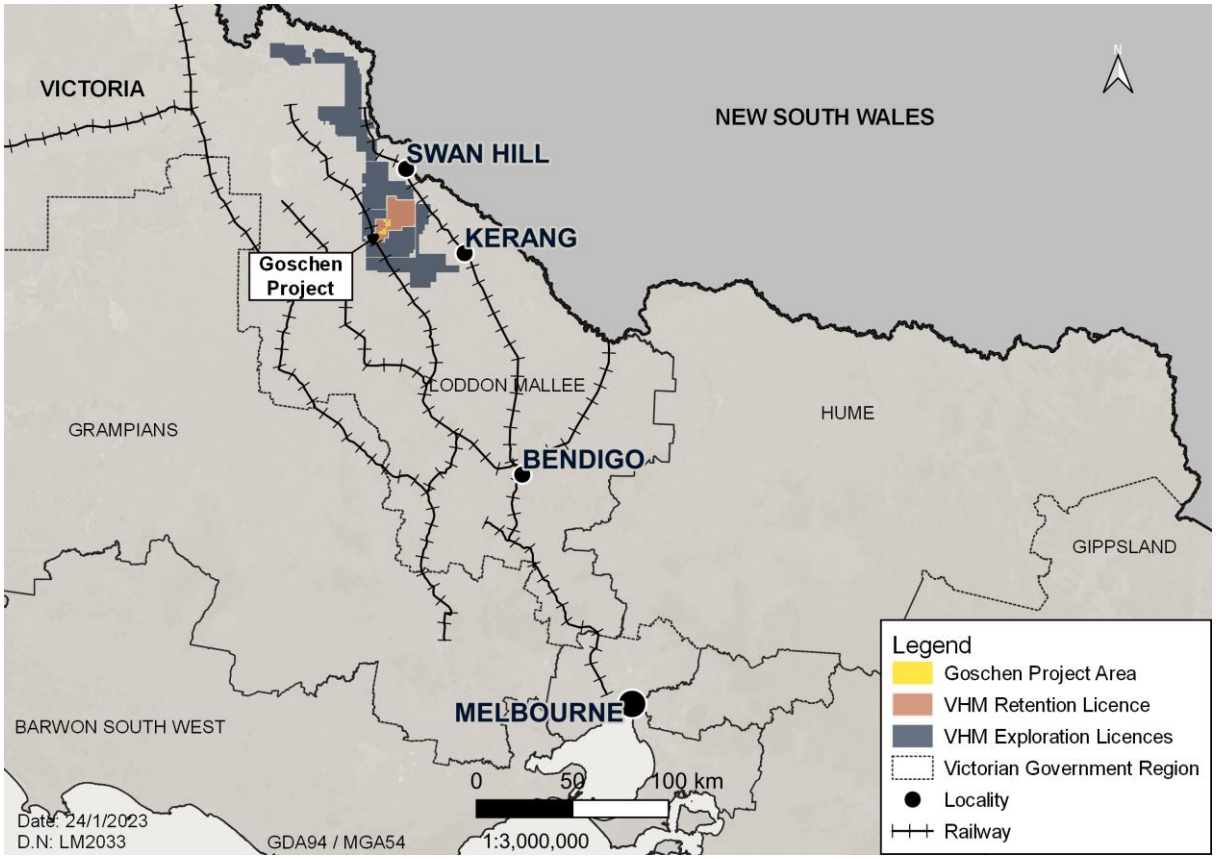

Figure 5 Project location

During extensive exploration, five mineralised zones were defined and initially considered for mining. These were known as Area 1, Area 2, Area 3, Area 4 and Area 5. Following further assessment and feasibility studies, the two most promising zones, Area 1 and Area 3, were subsequently selected for mining development.

2.1.1.2. Project receptors

Sensitive receptors have been identified within 5 km of the Project. The sensitive receptors include several rural residences surrounding the proposed mine, water channels and several reserves. Table 2 below summarises the distances to existing dwellings from the proposed mine and Figure 6 presents the location of each receptor in proximity to the Project mine site.

It should be noted that Receptor R0014 has been acquired and is not considered a sensitive receptor. Impacts predicted at these locations would therefore be of little consequence. Furthermore, R0009 has also been acquired, however this would not be considered a sensitive receptor during the Project once operations begin in Area 3.

Table 2 Distances of dwellings from the Project mine site boundary

Receptor ID	Description	Distance and Direction from the mine boundary
R0001	Residence	4.9km E (Area 3)
R0002	Residence	3.2km E (Area 1)
R0003	Residence	2.0km S (Area 1)
R0004	Residence	5.0km NNE (Area 3)
R0005	Residence	4.0km NNE (Area 3)
R0006	Residence	4.0km NE (Area 3)
R0007	Residence	1.6km NE (Area 3)

Receptor ID	Description	Distance and Direction from the mine boundary
R0008	Residence	2.3km NW (Area 3)
R0009	Residence	0.0km (Area 3)
R0010	Residence	3.0km WNW (Area 1)
R0011	Residence	2.6km WNW (Area 1)
R0012	Residence	1.0km S (Area 1)
R0013	Residence	0.6km NW (Area 1)
R0014	Residence	0.2km SW (Area 1)
R0015	Residence	1.0km SW (Area 1)
R0016	Residence	4.2km SWS (Area 1)
R0017	Residence	3.1km SE (Area 1)

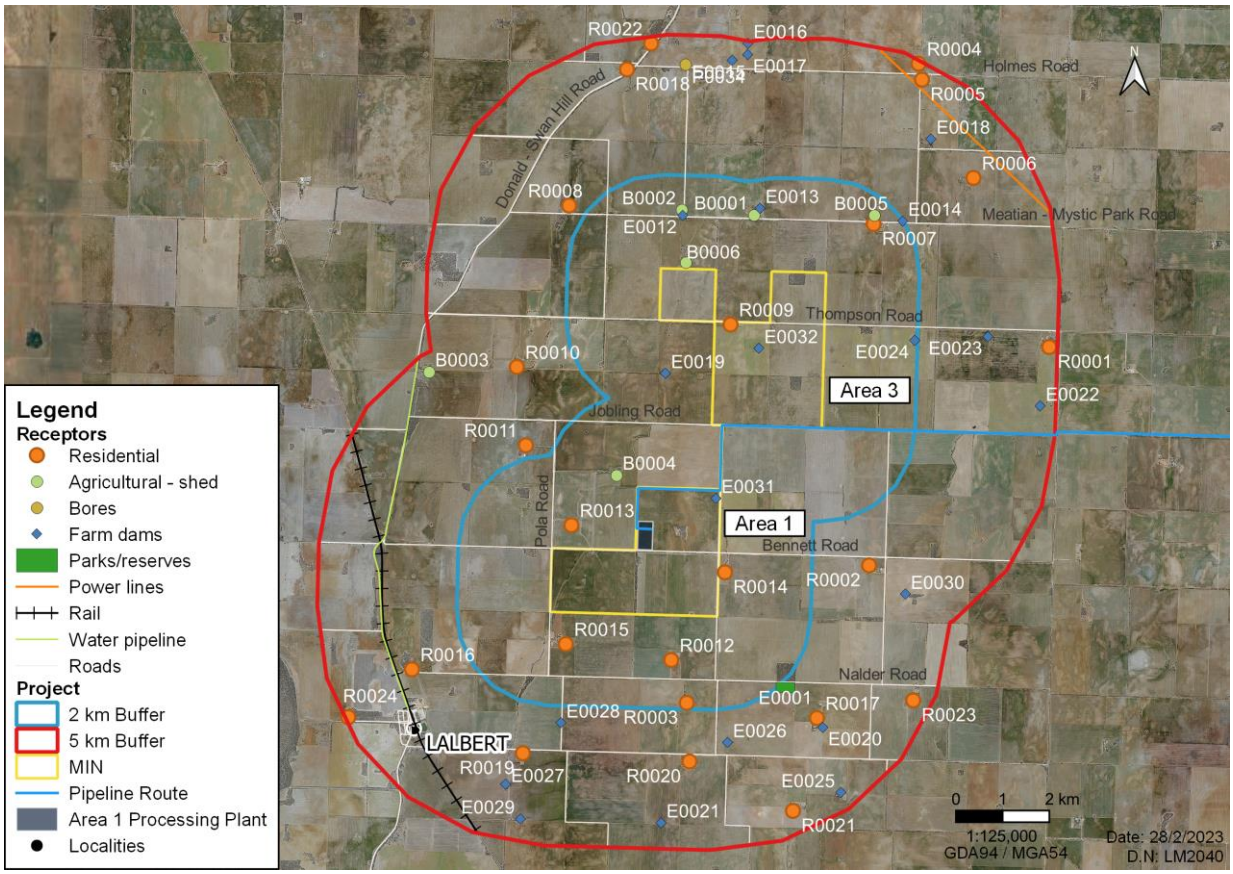

Figure 6 Sensitive receptors in proximity to the Project

2.1.2. Project rationale

VHM has developed the Project in the context of a rapidly growing global demand for rare earth minerals. This is largely driven by the transition to electric vehicles (EVs) in a market demanding geographic diversity of supply. Ideally positioned at the start of this demand curve, VHM would be able to produce rare earth mineral concentrates through the operation of the Project.

The demand for EVs, and therefore rare earth minerals, is forecast to grow materially over the next decade. The International Energy Agency (IEA) forecasts that, based only on the stated existing policy ambitions and targets that have been legislated for or announced by governments around the world, the number of EVs on the road will grow from 10 million in 2020 to almost 150 million in 2030 (IEA, 2021).

The Project's rare earth and zircon deposit is unique as the mineralisation occurs in the form of fully liberated sands near the surface. This is unlike many other deposits in Australia which are hosted within hard rock. This translates to significant cost benefits in both the mining and processing operations when compared to other rare earth mineral projects, which require handling and processing large quantities of material through crushing and grinding circuits.

Additionally, with China's rare earth production expected to increase just modestly in the years ahead, and few alternative sources of supply expected to come on stream, the availability of certain rare earth elements would grow increasingly scarce from 2021 onward. It is anticipated that from 2021 to 2030 the global rare earth industry would consistently under-produce neodymium, praseodymium, dysprosium and terbium oxides (or oxide equivalents), resulting in the depletion of historically accumulated inventories and, ultimately, shortages of these critical magnet materials if supply is not increased beyond levels currently anticipated.

In regard to zircon, most of the mineral is produced as a by-product of titanium feedstock production. Supply for zircon has been closely matched to demand throughout the period of 2015 to 2021, however supply from existing operations is predicted to decline over the forecast period to 2030. In addition, development of new sources of supply has been slower than expected leading to a forecast market deficit over the forecast period without new supply sources. If demand grows at a compound annual growth rate (CAGR) of 2.4% through to 2030 and if no new projects are brought into production, then an estimated 0.7 million tonne deficit of zircon could result.

2.2. Project objectives

The purpose of the Project is to mine and process heavy mineral sands and rare earths within two areas:

- Area 1 at 5 Mtpa ROM throughput capability for an expected life of mine of 10 years. The processing facility for ore extracted from Area 1 and Area 3 is also proposed to be located in Area 1, north of Bennett Road.
- Area 3 at 5 Mtpa ROM throughput capability for a further 15 years once mining of ore within Area 1 has ceased.

Collectively, these two mining areas are known as the Project area (refer to Figure 3).

2.3. Project description

The key components of the Project include:

- Mining – Mining would take 20 to 25 years at a throughput of 5 Mt per year and would occur above the groundwater table across approximately 1,479 hectares of farmland using conventional open cut mining methods of excavation, load and haul.
- Processing – The heavy mineral sands and rare earths ore would be separated via an on-site WCP and MSP to generate a rare earth mineral concentrate (REMC). Refining of the REMC on-site is limited to hydrometallurgical extraction to produce a mixed rare earth carbonate. Tailings from the various mineral processes would be homogenised and placed back into the ore zone earlier mined.
- Rehabilitation – The mined areas would be progressively backfilled in a staged manner, with tailings dewatered in-pit to allow overburden and topsoil placement in a profile that reinstates the background soil structure. This would result in the ability for a return to the current agricultural land uses within three years.
- Water - Water would be required for construction earthworks, processing, dust suppression and rehabilitation. 4.5 Gigalitres per year (GL/y) would be needed for the start-up of the Project, and then reduced to 3.1 GL/year during operations. Water would be sourced from Goulburn Murray Water (GMW) through the open water market, which has in excess of 500 GL/year in any year, from Kangaroo Lake. The water would be delivered from a new pumpstation adjacent to Kangaroo Lake and a 38 km underground pipeline to be constructed beneath existing local roads.

- Power – All electrical power needed for mining and processing would be produced from an on-site power plant able to be fuelled by diesel, LNG and/or LPG. A gradual evolution over the life of mine to renewables, hydrogen and/or battery will occur as technologies and commercial viability increase. Heat energy for the on-site gas fired appliances would be provided from an extension of the distribution network from the main LNG storage and regasification system.
- Transport – Final products would be containerised in 20ft sealed sea containers on site and exported via road to an intermodal at Ultima and then rail to the Port of Melbourne.

This DL application relates to the sewage treatment and power generation components of the Project only.

The sewage treatment plant and power station would be located within the processing plant of mining Area 1 for the life of the mine (refer to Figure 11).

2.3.1. Power station

The proposed power station would be located within the process plant area of the site (refer to Figure 11). Key features of the proposed power station include:

- 12 installed Cummins KTA50 or equivalent, 850 kW, 11 kV dual fuel generating sets with spare bays for two additional generator sets in an engine shed that is fitted with an overhead crane for maintenance.
- 11 kV switch room with provision for alternative renewable energy inputs and future expansion.
- Fuel storage for diesel and liquefied natural gas (LNG) or liquid petroleum gas (LPG) each with capacity for 10 days operation (refer to Section 7.7).
- Power station controls and communications for remote monitoring of the power station.

Dual fuel generators are proposed to use either diesel or natural gas fuel to improve the fuel efficiency. The main benefits of a dual fuel power station in comparison to a diesel fuel power station include reduced emissions, reduced fuel storage and increased flexibility with consideration to market conditions.

The dimensions of the power station would be approximately 62.5 m by 10.5 m by 6 m. A render of the proposed power station is provided in Figure 7 and an indicative layout is provided in Figure 8.

Figure 7 Render of proposed power station

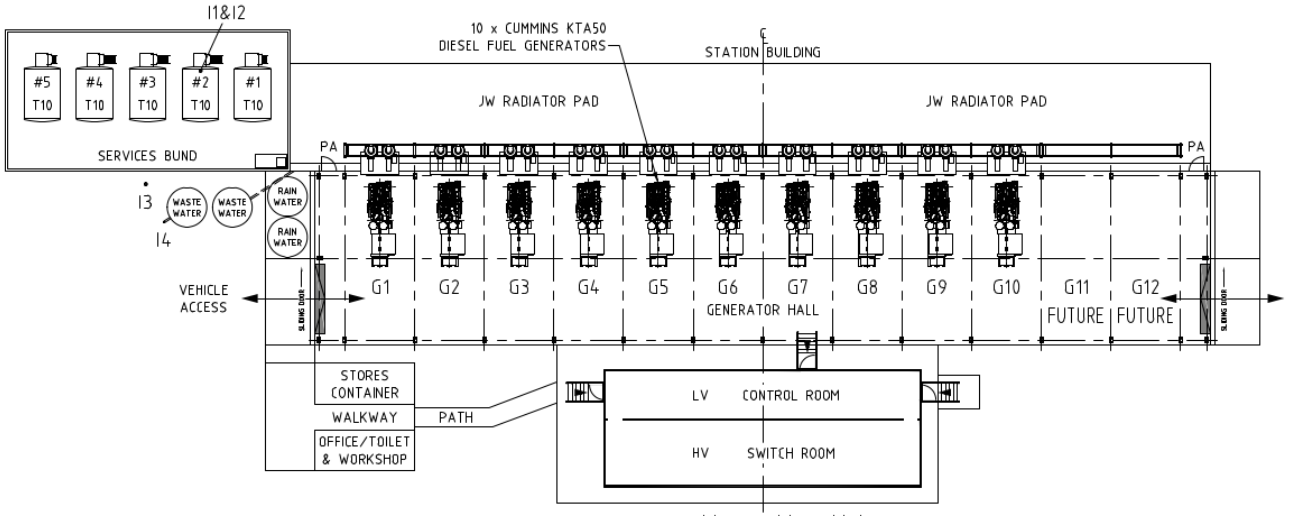

Figure 8 Proposed power station layout

2.3.1.1. Power station process description

Dual fuel power stations generate electricity via combustion. Rotational energy is generated when fuel is combusted, and an alternator connected to the shaft of the engine converts the rotational energy to electrical energy.

Typical components of a dual fuel power station include generators, fuel storage, air intake and filter, an exhaust system and a cooling system.

The power station would operate with 12 duty generator sets operating at around 75% full load and two standby units to allow for maintenance and in the event of breakdowns. Two spare bays are proposed in the engine house for future expansion.

Due to the large distances between the different motor control centres (MCC) on the site, the HV reticulation system will deliver power to the site distribution switchboards. The power station HV system will consist of an HV switch room with the switchgear including:

- 6 outgoing cubicles
- Incomer cubicles
- Space for 3 spare cubicles (future expansion)
- 2 Bus tie cubicles

The switch room will house all communication and Supervisory Control and Data Acquisition (SCADA) equipment to operate the power station.

As 11kV generators are proposed there will be no requirement for a HV substation.

There are six 11kV circuits to feed the various equipment loads across the mine. Five are for the plant and one is for the non-process infrastructure (administration building, store warehouse, workshop) as below:

- Mining Unit Plant LV Motor Control Centre
- WCP LV Motor Control Centre 1
- WCP LV Motor Control Centre 2
- REMC Motor Control Centre 1
- Admin Building Indoor Distribution Centre
- MSP LV Motor Control Centre

Provision is made for the installation of additional feeders for future expansion and the power station would have the capability for renewable energy inputs. This would ensure that when renewable energy is readily available and feasible to use for the Project, it can be used as part of Project power supply.

Impacts to air quality and noise emissions from the operation of the power station are discussed in Section 7.3 and Section 7.4.

2.3.2. Sewage treatment

The sewage treatment plant would consist of an off-the-shelf sequencing batch reactor (SBR) and would be designed for a maximum capacity of 20,000 L/day. The sewage treatment plant would treat effluent from on-site ablutions (showers, amenity and toilets) to a standard similar to Class C recycled water. Water used in on-site ablutions would be sourced from Kangaroo Lake, which has a mean salinity of 360 electrical conductivity (EC) (Kellogg, Brown & Root Pty Ltd, 2011). This water would be filtered and treated with chlorine or ultraviolet radiation prior to use in on-site ablutions.

The basis for the 20,000-litre design considers a 245 person capacity and is summarised in the table below.

Table 3 Sewage treatment design basis

Flow	Persons	Litres per person per day	Litres per day
Staff with showers	113	80	9,040
Staff without shower	132	40	5,280
Laundry	-	-	2,500
Total	245		16,820

The estimated biological oxygen demand (BOD) and ammonia (NH_3) concentrations of the sewage water to be treated is presented in the table below.

Table 4 Estimated BOD and ammonia sewage concentrations

BOD	Persons	gm/person/day	gm/day
Staff with showers	113	30	3,390
Staff without shower	132	25	3,300
Total	245		6,690
NH_3	**Persons**	**gm/person/day**	**gm/day**
Staff with showers	113	8	904
Staff without shower	132	7	924
Total	245		1,828

The water quality treatment objectives for the sewage treatment plant are summarised below.

Table 5 Water quality objectives (EPA Publication 1910, March 2021)

Class	Water quality objective	Use
C	• <1,000 E. coli org/100 mL • pH 6 – 9 • <20 / 30 mg/L BOD /SS	Industrial: Systems with no potential worker exposure

Following treatment, it is proposed that effluent would be recycled and mixed with raw process water sourced from Kangaroo Lake for use as part of mineral processing. This would be a closed, industrial system with no public access. A draft Health Environment Management Plan (HEMP) has been

prepared to identify the potential risks to human health and the environment associated with the reuse of treated effluent for mineral processing (refer to Appendix B).

During operations, the water requirement to operate the Project would be 3.1 GL/year. As such, treated effluent from the sewage treatment plant would make up less than 0.5% of the water used within mineral processing. There would be no direct discharge of treated effluent, with the mixed process water ultimately forming part of the tailings that would be deposited on-site within mining pits.

As described in Section 1.4, an A18 permit would also be prepared for the disposal of tailings in-pit during mining operations. Nonetheless, for completeness, impacts to groundwater from the operation of the sewage treatment plant and the release of water from deposited tailings are discussed in Section 7.6.

The preliminary design of the sewage treatment plant would consist of four to five above ground tanks, with the largest estimated to be 46 cubic metres (m^3) in capacity (refer to Figure 9).

2.3.2.1. Sewage treatment process description

The system may be described in its five key functions:

- Collection and Screening of Sewage: Waste from on-site ablutions gravitates to inground pumping stations (IPS) which are fitted with submersible sewage grinder pumps. Sewage from the pump stations is pumped into the aerated Flow Balance Tank (FBT) in which it's pH will be corrected and kept aerobic.
- Treatment of Sewage - Mixed and blended sewage will be pumped to the 46 m^3 SBR. Reagents will be automatically dosed into the incoming mainstream to the SBR to remove phosphorous from the wastewater. The SBR will operate on a mix/aerate/settle/decant cycle, with the pump feeding only during the mix/aeration period in the SBR. The SBR will be aerated by a blower and aeration lances. The contents will then be settled, and treated effluent will be decanted to the treated effluent tank. Excess biosolids from the SBR will be pumped out to a 10 m^3 sludge holding tank for thickening and ultimately be disposed of off-site by a suitably licenced contractor. Supernatant from the thickening tank will return to the balance tank. All chemicals and reagents will be stored within the process plant area according to applicable standards and spill response procedures will be in place.
- Post-Treatment of wastewater - Treated effluent from the SBR will be chlorinated while decanting into a 10m^3 treated effluent tank, which will also act as a chlorine contact chamber. Treated effluent in the storage tank will be mixed using a small side stream blower and after the 30-minute contact time the treated effluent will be pumped through a sand filter and across to the tailings circuit.
- Monitoring and Operations **-** The entire system will be fully automated and controlled via a programmable logic controller (PLC). The controls will be housed in a stainless steel MCC. The treatment plant also has the capability to be remotely monitored by Aerofloat staff in Sydney. On-site operator(s) will be trained in the monitoring/control of the system. Original equipment manufacturer (OEM) supplier will be sought to undertake regular scheduled maintenance activities.

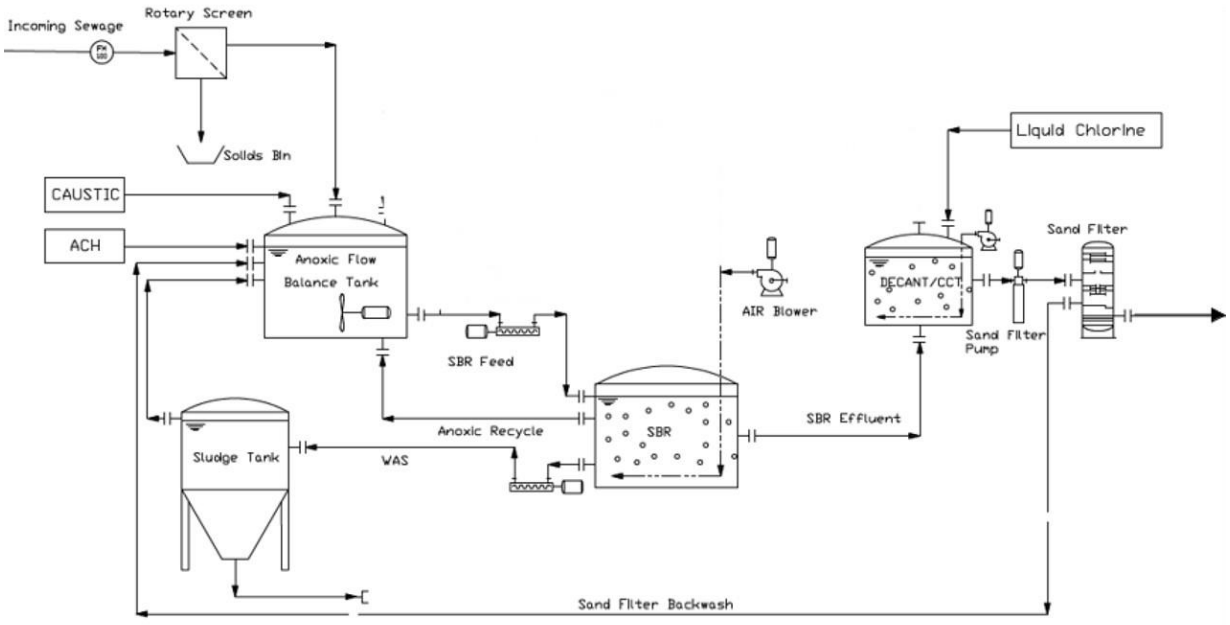

Figure 9 Sewage treatment flow diagram

A Typical layout of a SBR sewage treatment plant is presented in Figure 10 below. The plant would consist of a 25 m^3 anoxic tank, a 46 m^3 SBR tank, a 10 m^3 sludge tank and a 10 m^3 squat tank for effluent storage and chlorine contact (refer to Figure 9).

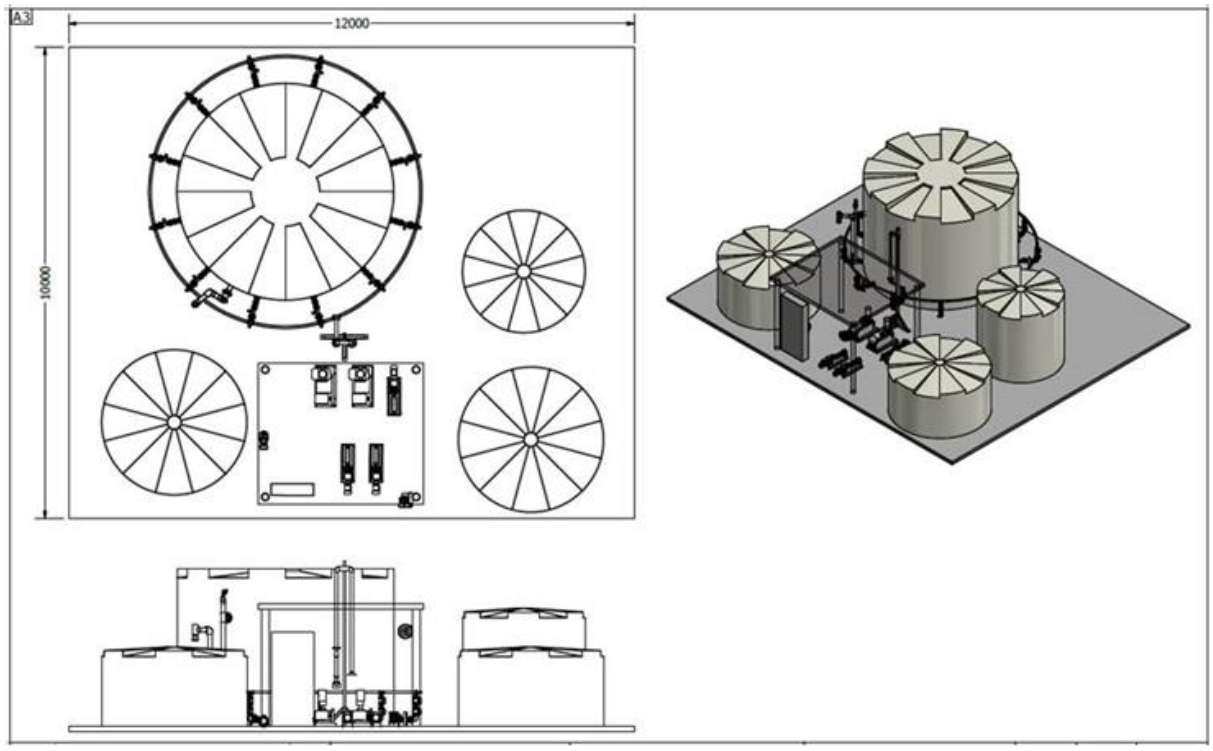

Figure 10 Typical SBR layout

An overview of the Project and its components is shown in Figure 11 and Figure 12. The sewage treatment plant and power plant would be located within the Area 1 processing plant (refer to Figure 11).

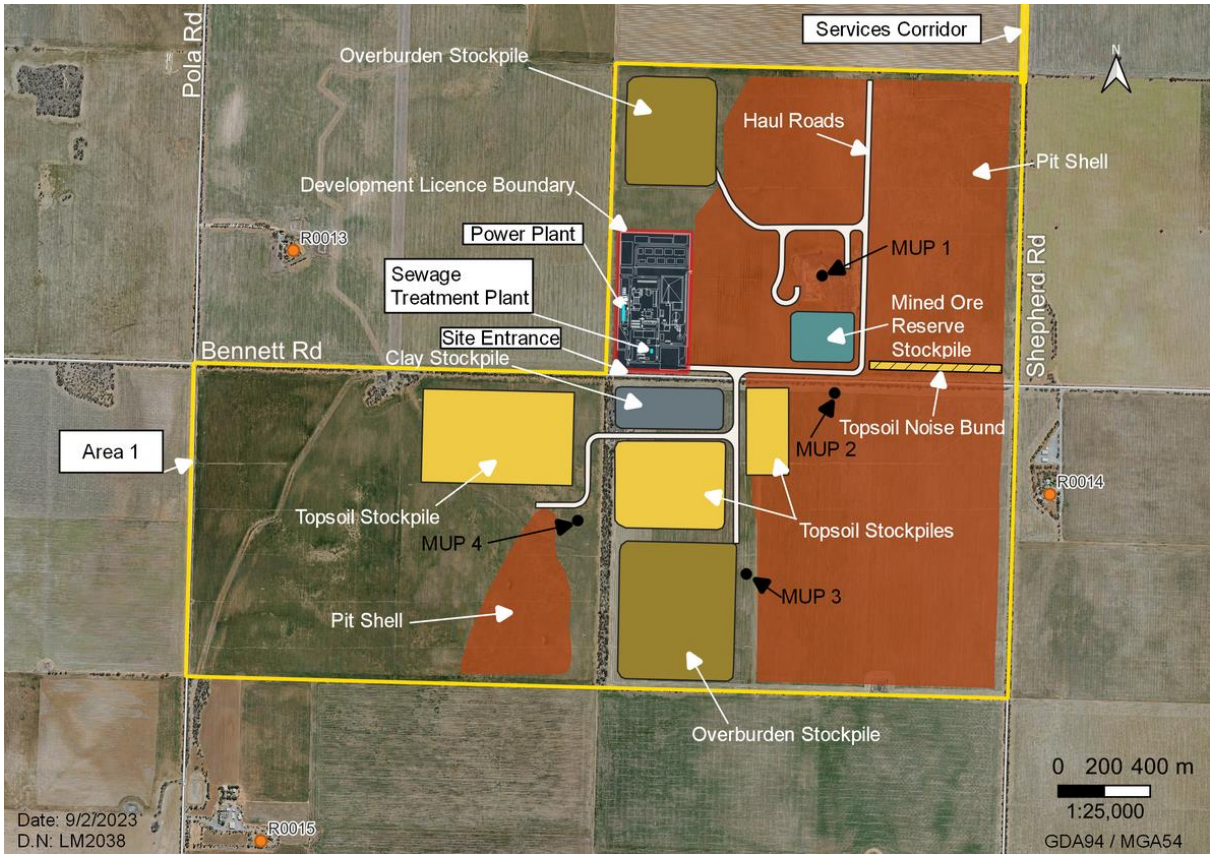

Figure 11 Mining Area 1 proposed layout with Development Licence boundary

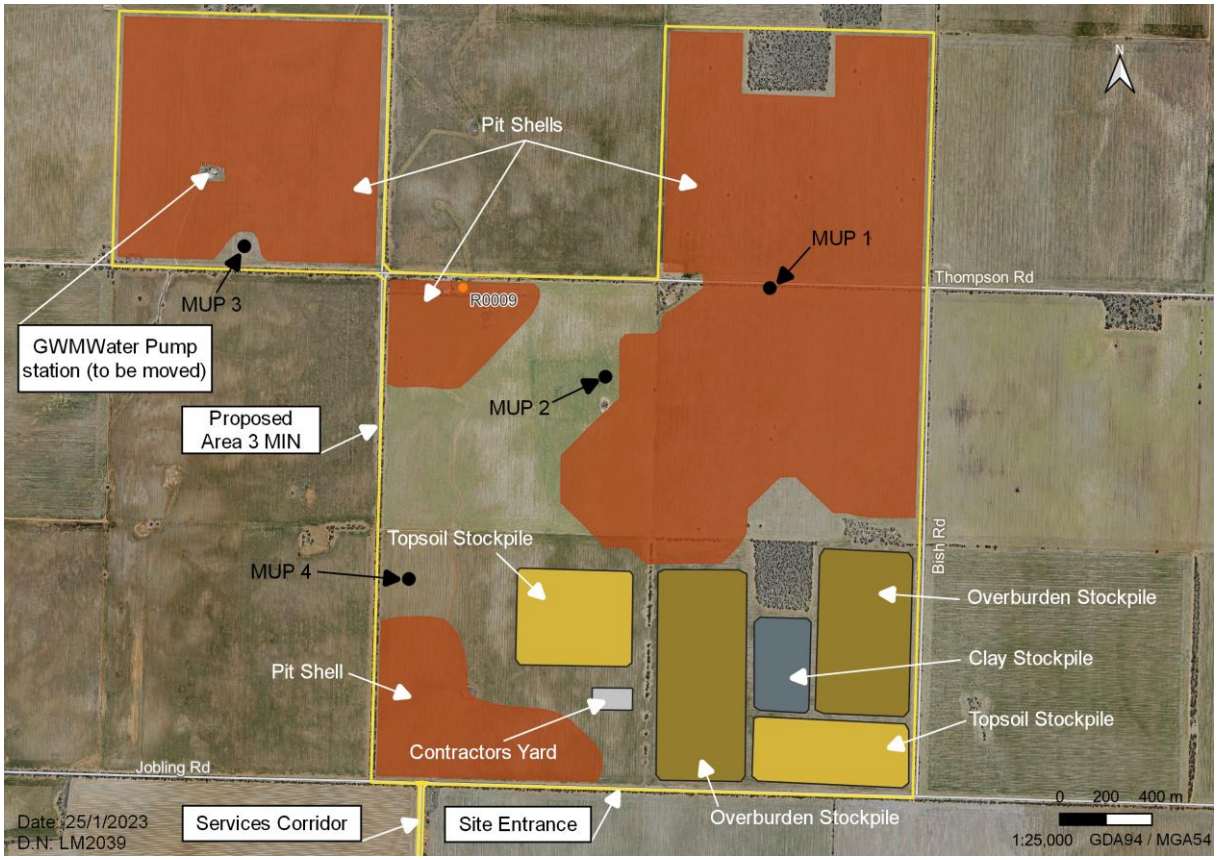

Figure 12 Mining Area 3 proposed layout

3. Planning and other approvals

The Project was referred by VHM to the Minister for Planning under the *Environment Effects Act 1978 (Vic)* (EE Act) on 7 September 2018 describing the potentially significant effects of the Project following a preliminary assessment of the proposed Project. The Minister for Planning requested that VHM prepare an Environment Effects Statement (EES) under the EE Act to assess the potential environmental effects of the Project and to inform the Minister's assessment of the Project and the approvals required for the Project.

The Minister's reasons for making this decision included that the Project works have 'the potential for a range of significant environmental effects' including on:

- A very large extent of native vegetation and associated biodiversity values, including listed threatened species and communities.
- Surface water and groundwater (i.e hydrology, quality, availability) and protected beneficial uses.
- Existing land uses, amenity (i.e air quality, noise and traffic) and landscape values of the project area and those associated with the broader area.
- Aboriginal cultural heritage values.

In accordance with the EES scoping requirements, a Technical Reference Group (TRG) was convened and chaired by the Department of Transport and Planning (DTP) Impact Assessment Unit on behalf of the Minister for Planning. The TRG included a number of regulatory authorities who provided input throughout the EES process.

The regulatory authorities that were part of the TRG included:

- Department of Energy, Environment and Climate Action.
    - Loddon Mallee Region
- Heritage Victoria
- Department of Health.
- Department of Transport and Planning.
    - Impact Assessment
- Earth Resources Regulation.
- Environment Protection Authority Victoria.
- First Peoples – State Relations.
- Gannawarra Shire Council.
- Goulburn Murray Water.
- Grampians Wimmera Mallee Water.
- Mallee Catchment Management Authority.
- North Central Catchment Management Authority.
- Swan Hill Rural City Council.

VHM must obtain a number of statutory approvals for the Project at State and Commonwealth levels. A summary of the approvals specific to the activity is provided in Table 6.

Table 6 Primary State and Commonwealth approvals for the Project

Jurisdiction	Legislation	Responsible Minister / Statutory Approval Authority	Approval
State	*Aboriginal Heritage Act 2006 (Vic)*	Minister for Aboriginal Affairs First Peoples State Relations and relevant Registered Aboriginal Party	Cultural Heritage Management Plan (CHMP) Covers the management for the entire Project disturbance – both inside and outside the mining licence (MIN).
State	*Planning and Environment Act 1987 (Vic)*	Minister for Planning DTP	Planning Scheme Amendment (PSA) PSA with SCO (Specific Controls Overlay) to the Gannawarra Planning Scheme and Swan Hill Planning Scheme It is proposed to apply a SCO with an Incorporated Document in the EES and will cover: - Vegetation removal - Pipeline construction - Road works and truck movement plan Off-Set Management Plan Documents the acquisition of off-sets for the removal of native vegetation for the project. Could be VHM acquired land and/or third party off-sets.
State	*Mineral Resources (Sustainable Development) Act 1990 (Vic)*	Minister for Resources Department Jobs, Skills, Industry and Regions (DJSIR) Earth Resources Regulation (ERR)	Mining Licence Mining Licence to be applied for prior to Minister's for Planning's Assessment of the environmental effects. Work Plan Incorporates all the document and plans for management of the mining activities within the MIN. Draft Work Plan will be exhibited with EES. Based on outcomes (and recommendations from EES) document will need to be updated prior to final submission.

Jurisdiction	Legislation	Responsible Minister / Statutory Approval Authority	Approval
State	*Environment Protection Act 2017 (Vic)*	Minister for Energy, Environment and Climate Change EPA	Development Licence Prescribed permits In accordance with Schedule 1 of the Environment Protection Regulations 2021, VHM require a development licence for sewage treatment (A03) and for power generation (K01). A permit is also required for the discharge or deposit of waste to aquifer (A18).
Commonwealth	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*	Minister for the Environment (Cth) Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Environment Protection and Biodiversity Conservation (EPBC) Approval Approval of the project which is a controlled action. The EES and the Minister's assessment will examine impacts on relevant MNES and will be provided to the Australian Minister for the Environment to inform the decision about whether and under what conditions to approve the project under the EPBC Act.
State	*Flora and Fauna Guarantee Act 1988 (Vic)*	Minister for Energy, Environment and Climate Change Department of Energy, Environment and Climate Action (DEECA)	Protected Flora Licence or Permit Any removal of protected flora, which includes threatened flora species and the plants that make up threatened communities, listed under the FFG Act from public land requires a Protected Flora Licence or Permit under the *Planning and Environment Act 1987*, obtained from DEECA Off-Set Management Plan Documents the acquisition of off-sets for the removal of native vegetation for the project. Could be VHM acquired land and/or third party off-sets.
State	*Heritage Act 2017 (Vic)*	Minister for Planning / DTP	Permit The project will require permits and consents from Heritage Victoria where any protected place or object is proposed to be disturbed.
State	*Radiation Act 2005 (Vic)*	Minister for Health / DHHS	Radiation Management Plan, Radiation Transport Management Plan, Radioactive Waste Management Plan and Radiation Environment Plan All four plans required for the project. All key components exhibited with EES.

Jurisdiction	Legislation	Responsible Minister / Statutory Approval Authority	Approval
State	*Road Management Act 2004, the Road Safety Act 1986 (Vic)*	Minister for Roads and Road Safety Department of Transport (DoT) (and Gannawarra Shire Council and Swan Hill Rural City Council for roads managed by Council)	Traffic Management Plan Any road upgrades or works planned on a road, lane, street or footpath, will require a Traffic Management Plan to be submitted to the relevant road authority (VicRoads or Gannawarra and / or Swan Hill Rural City Council) Road works permits Functional and detailed design plans will be submitted to the road authority for approval prior to the commencement of any works. A 'works within the road reserves permit', 'road opening permits' and 'vehicle crossing permits' will be sought as required. Over-size vehicle permits: The National Heavy Vehicle Regulator (NHVR) issues permits for oversized vehicles. VicRoads, on behalf of NHVR, will require at least 28 days to assess any route
State	*Water Act 1989 (Vic)*	Minister for Water / North Central Catchment Management Authority	Consent for minor waterway work will be required for each crossing of a waterway by the proposed water supply pipeline Approval from the North Central Catchment Management Authority would be required for any works on, over or under a designated waterway. Approval is required before the commencement of construction.

4. Environmental performance and track record

VHM is committed to protecting the environment and minimising any potential environmental impacts arising from its operations or its products. The environmental aspects of VHM's operations are governed by environmental regulations, and subject to project and site-specific environmental permits and approvals, at both the Commonwealth and State government levels.

VHM has a dedicated and experienced team of in-house environmental professionals and leverages the specialist technical expertise of environmental consultants.

4.1. State of knowledge

VHM is an Australian owned and operated ASX listed public company established in 2014. VHM is developing an integrated business comprising of rare earths and heavy mineral sands projects across Victoria, providing raw material for processing and manufacturing to downstream customers. VHM seeks to be a sustainable and reliable producer of high-grade, ethically sourced rare earths and critical minerals, such as neodymium (Nd), praseodymium (Pr), dysprosium (Dy) and terbium (Tb), as well as zircon (Zr) and titanium (TiO2). Their mined resources are used in smart phones, LED lights, TVs, electric vehicles, paints, ceramics, wind turbines, pharmaceuticals, and medical and military hardware.

The preferred method of delivering the Project is via one or more contracts with one or more engineering, procurement and construction (EPC) contractors to execute the Project on its behalf. The roles, rights and responsibilities of the EPC contractor(s) and VHM will be defined through principal contracts to which will be annexed supporting documentation, including Project definition scopes, agreed flow sheets, battery limits, design criteria and applicable standards.

Under the principal contracts and their supporting documentation, the EPC contractors will execute all aspects of the Project for and on behalf of VHM. Specifically, the EPC contractors will manage and deliver the engineering design, either through in-house expertise and/or by managing and coordinating the design of others. The contractors will procure all goods and services for the Project, including all vendor documentation and data requirements and manage all freight and logistics for the Project to ensure timely arrival of equipment and construction materials to meet schedule requirements.

The contractors will also commission their contracted portion of the Project using in-house resources and expertise and/or by managing and coordinating commissioning by others where others are typically vendors of processing plant. The commissioning phase will coincide with a training phase in which the EPC contractors will train VHM operators in running the plant where required.

The EPC contractors will also manage, monitor, control and coordinate all designers, constructors, fabricators and vendors for and on behalf of VHM using a suite of project controls that the EPC contractors and/or subcontractors will install. This management will have specific regard to the health and safety of personnel engaged on the Project and its environmental impact.

The EPC contractors will deliver to VHM all drawings and other documentation necessary to operate and maintain the plant – referred to as the manufacturer's data report (MDR).

Engineering will be undertaken in two phases: the front end engineering design (FEED); and the detailed design (DD), construction support and training phase. The FEED phase will be undertaken by an engineering design house contracted directly to VHM. The DD phase will be contracted and managed by the EPC contractor.

While contractors will execute the Project on VHM's behalf, VHM will always maintain the principal accountability for any legislative conditions or commitment that apply to this Project. Those requirements will be specifically imposed on any contractor that performs work on the Project. These requirements will be expressly stated in any relevant construction or operations agreement and/or through the supplier's and contractor's requirements to comply with VHM's environmental and site management plans (refer to EES Chapter 21: Environment Managemental Framework [AECOM, 2023b]). Contractor's Project plans and their requirement to meet VHM's primary obligations will be reviewed by VHM prior to the commencement of any works.

5. Community and third-party engagement

This section briefly sets out the key stakeholder engagement and consultation that has been undertaken to support the preparation of the EES and, more broadly, to assist in the development of the project.

An extensive engagement and consultation program was undertaken to ensure that the community and interested stakeholders were informed, involved and able to actively contribute to the development of the project and preparation of the EES.

A Consultation and Community Engagement Plan has been drafted by VHM in accordance with the final scoping requirements. This plan has been developed to guide how VHM will engage with the community and other stakeholders on the Project during the EES process. It outlines the approach to engaging with community members and other stakeholders and sets out the key activities for informing them about the Project and providing opportunities for input. The plan also sets out a process for monitoring and evaluating the effectiveness of engagement activities to ensure that they are meeting the needs of stakeholders and providing a range of opportunities to provide input.

The Consultation and Community Engagement Plan will be published on the DTP website after it has been finalised.

5.1. Overview of engagement to date

VHM commenced stakeholder engagement in 2018 to introduce the Project to individuals and stakeholders that would be directly involved in or impacted if the Project were to proceed. A Stakeholder and Community Reference Group was established to provide a forum for open communication between VHM and Project stakeholders. In particular, the purpose of the group was to:

- Provide feedback on the design and development of the Project.
- Provide feedback on community attitudes and expectations.
- Provide feedback on the scope and draft findings of technical studies undertaken as part of the EES.
- Suggest, workshop and develop potential community benefit projects.
- Provide feedback on stakeholder engagement for the Project.

The intention was for the group to maintain up to 10 members, which included representation from local landholders and businesses, community groups and environmental groups, Gannawarra Shire and VHM. Initial engagement involved four stakeholder and community reference group meetings in the local town of Lalbert, between February 2019 and August 2019.

More recent communication and engagement has expanded to include community information and feedback sessions, Project update sheets and frequently asked questions, advertisements in local newspapers and radio, a Project webpage, webinars, establishment of a Project telephone line and email address and information displays set up in the community at frequently attended places, such as at local shopping centres, markets and at the Lalbert Football Club.

Table 7 below summarises engagement and consultation from May 2018 to November 2022.

Table 7 Summary of engagement

Activity	Description	Target Audience
Media and advertising	16 EES technical study posters issued on VHM's website for public review.	Government Neighbours and local residents Landowners Landholders and occupiers Business and industry Community and interest groups

Activity	Description	Target Audience
		Traditional Owners and Indigenous groups
Community information sessions and booths	Nine pop-up style community information booths at community markets and events across Cohuna, Kerang, Lalbert and Murrabit. Nine in-person and three virtual community information sessions. In-person events at local, accessible venues in Kerang, Lalbert, Quambatook, Swan Hill and Ultima.	Government Neighbours and local residents Landowners Landholders and occupiers Business and industry Community and interest groups Traditional Owners and Indigenous groups Recreational users of Kangaroo Lake Wider community
TRG meetings	Eight meetings held. A pipeline route site tour.	Members of the TRG convened by DTP on behalf of the Minister for Planning as part of the EES process
Meetings	Two meetings with Gannawarra Shire Council and two meetings with Swan Hill Rural City Council. Briefing with Traditional Owners and Indigenous groups. Four stakeholder and community reference group meetings.	Government Neighbours and local residents Landholders and occupiers Business and industry Community and interest groups Traditional Owners and Indigenous groups
Letters and emails	Five Project update newsletters issued. Three Project fact sheets issued about VHM, regulation to develop the Project, road safety and the exploration program. A letter issued to landholders advising the recommencement of the Project.	Government Neighbours and local residents Landholders and occupiers Business and industry Community and interest groups Traditional Owners and Indigenous groups

Further information about the consultation activities undertaken and planned for the Project are provided in EES Chapter 22: *Community & stakeholder engagement* (AECOM, 2023c).

5.2. Consultation findings and response

VHM has sought to understand and address stakeholder and community feedback received during preparation of the EES and consider, and where possible incorporate, this feedback in the design of the project.

In addition, VHM has sought to provide stakeholders and the community with information about the key areas of concern through targeted communications collateral (displays and presentations) and targeted community meetings.

Table 8 provides a summary of key issues raised and how these were addressed in the EES and project design. Refer to the relevant EES technical reports and chapters for further information.

It is noted that no community concerns were specifically raised in regard to the proposed power station and sewage treatment plant.

Table 8 VHM responses to stakeholder and community feedback

Issue raised	Response to issue	Location in the EES
Environmental impacts		
Concerns about process water run-off leaving the mine site and managing water in high rainfall events similar to that which caused the 2022 floods across the region.	• An impact assessment study was undertaken to evaluate potential on-site surface water impacts of the project – this study examines surface water impacts within the mining lease and is designed to ensure all water remains within the mining licence boundaries. • A separate regional surface water impact assessment was also undertaken to consider the impact of the project on surface water run-off across the region.	EES Chapter 13 Surface water and EES Technical Report H2: Mine site surface water impact assessment. EES Chapter 13 Surface Water and EES Technical Report H1: Regional surface water impact assessment.
Concerns raised about the mining operation impacting groundwater, particularly tailings leaching into the water table.	• A groundwater impact assessment study was undertaken to assess the potential for the project to impact groundwater and the hydrogeological system.	EES Chapter 14 Groundwater and EES Technical Report I: Groundwater impact assessment.
Concern about the impacts to remaining native vegetation and fauna in the region and ability to preserve existing patches of remnant and roadside native vegetation and general ecology along the proposed water supply pipeline route.	• A native vegetation and flora impact assessment study, together with a vertebrate fauna ecology study, were undertaken to assess project impacts on biodiversity. • Subsequently further impact assessment studies were undertaken to assess the impact on aquatic ecology to review aquatic fauna at Kangaroo Lake; and an arboricultural impact assessment was undertaken to assess the trees along the proposed water supply pipeline route and provide recommendations to minimise any potential losses.	EES Chapter 7 Flora and fauna ecology and EES Technical Report B: Vertebrate Fauna Ecology. EES Chapter 7 Flora and fauna ecology and Native Vegetation and EES Technical Report A: Flora Ecology.
Community and economic impacts		
Concerns raised about social cohesion – some farmers benefitting from	• A social impact assessment has been undertaken to consider the potential issues and impacts on social	Chapter 22 Community and stakeholder

Issue raised	Response to issue	Location in the EES
the mining operation, others not, but still bearing impacts from increased traffic on local roads, noise, visual amenity.	values of the community, including community cohesion and wellbeing.	engagement and EES Technical Report O: Social Impact Assessment.
Decreased value of farmland post-mining.	• A draft rehabilitation plan has been prepared to outline the key objective to achieve safe, stable and sustainable broadacre agriculture on completion of rehabilitation and mine closure works. • The agriculture impact assessment study has been undertaken to assess the project impacts at the regional and local levels and propose mitigation measures to identify and reduces impacts to as low as practicable.	EES Chapter 19 Rehabilitation and closure and EES Technical Report P: Rehabilitation and closure. EES Chapter 16 Agriculture and EES Technical Report L: Agriculture Impact Assessment Study.
Concerns raised over local employment – locals having opportunity to work on the project as well as the project providing indigenous employment and training opportunities, but also depleting local businesses of workers who pursue higher income from mining jobs.	• A social impact assessment study has been undertaken to identify the potential and likely social impacts as a result of the project and recommend a number of mitigation measures to deal with local employment and upskilling.	EES Chapter 22 Community and stakeholder engagement EES Technical Report O: Social Impact Assessment
Concerns about sourcing labour force and skills that may not be available locally and being able to accommodate an expanding workforce in an already tight housing market across the region.	• The social impact assessment study has identified the likely impacts of a skilled workforce that may need to be imported to the region for construction and initial operations and recommends mitigation measures to deal with accommodation requirements.	EES Chapter 22 Community and stakeholder engagement EES Technical Report O: Social Impact Assessment
Concerns about opportunity not being afforded to local businesses to service the project and sourcing suppliers and services from outside the local area.	• The economic impact assessment study has identified the likely impacts that development of the project would bring to the Loddon-Mallee region across the life of the project. VHM has also developed a local employment policy which is one of several mitigation measures outlined in the social impact assessment to address local employment and service provision.	EES Chapter 22Community and stakeholder engagement EES Attachment IV Economic Assessment of the Project EES Technical Report O: Social Impact Assessment.
Concern expressed about smaller communities in the region not being able to	• The economic impact assessment study outlines the potential economic benefits to the Loddon-Mallee region.	EES Chapter 22 Community and

Issue raised	Response to issue	Location in the EES
benefit economically and socially from the project, rather than benefits concentrated in the larger townships of Swan Hill and Kerang.	• The social impact assessment study addresses the potential for smaller surrounding communities to benefit socially and economically during the life of the project.	stakeholder engagement EES Technical Report O: Social Impact Assessment
Concern expressed on how nuisance issues and complaints can be raised with VHM and whether a project shopfront will be established in Kerang or Swan Hill.	• Forming part of the EES, the project's draft work plan contains the community engagement plan which details VHM's formal complaints management process. • In 2023 VHM will establish an official project shopfront at its base in Tate Drive, Kerang.	EES Chapter 21 Environmental Management Framework EES Attachment I Draft Work Plan.
Agriculture and rehabilitation		
Concern expressed on ability to successfully rehabilitate the mining area to pre-mining agricultural production levels and the land value being significantly decreased as a result of reduced agricultural production capacity.	• A draft rehabilitation and closure plan has been prepared to outline the key objective to achieve safe, stable and sustainable broadacre agriculture on completion of rehabilitation and mine closure works. • The agriculture impact assessment study has been undertaken to assess the project impacts at the regional and local levels and propose mitigation measures to identify and reduces impacts to as low as practicable..	EES Chapter 19 Rehabilitation and Closure and EES Technical Report P: Rehabilitation and closure plan. EES Chapter 16 Agriculture and Soils and EES Technical Report L: Agriculture Impact Assessment Study.
Traffic and transport		
Concern expressed about upgrade and maintenance of local roads to safely accommodate the increased volume of traffic, and particularly that landholders be given priority to move large pieces of farming equipment to access land and maintain agricultural production immediately neighbouring the mine footprint.	• The transport impact assessment study addresses impacts to transport associated with the project. Key components of the study include the stakeholder engagement plan to involve key stakeholders who will help shape the traffic management plan that will ensure construction and operational transport activities meet stakeholder, operational and regulatory requirements.	EES Chapter 10 Traffic and transport and EES Technical Report E: Traffic and transport.
Amenity, health and public safety		
Concern expressed about the visibility of the mining operation and how light pollution can be managed.	• The landscape and visual impact assessment study has been undertaken to address the visual amenity and measures for managing light during night time operations.	EES Chapter 9 Landscape and visual and EES Technical Report D: Landscape and visual.
Concern raised about the level of dust generated during mining operations	• The air quality impact assessment study details the key impacts from the project and the best practice mitigation measures recommended to ensure dust emissions	EES Chapter 12 Air quality and EES

Issue raised	Response to issue	Location in the EES
and potential for excess dust deposition on crops in neighbouring farmland.	remain at controllable and low levels, including implementation of an air quality monitoring plan with continuous monitoring.	Technical Report G: Air quality. EES Chapter 21 Environmental management framework.
Concern about radioactivity in the mineral sands, impacts to human health, and the likelihood of radioactivity in the groundwater after mining.	• The radiation impact assessment study has been undertaken to assess exposure receptors, exposure pathways, radioactivity levels due to the project, calculate exposures and doses and compare results to Australian standards.	EES Chapter 17 Radiation and EES Technical Report N: Radiation. EES Chapter 21 Environmental management framework.
Concern raised about noise levels and how noise will be managed during 24/7 operations.	• The noise impact assessment study has been undertaken to understand background noise levels and recommend a number of key mitigations for project design and subsequent operations to ensure noise levels remain below regulatory requirements.	EES Chapter 11 Noise and EES Technical Report F: Noise.

Further information about the key consultation findings and the manner in which they have been responded to during the EES process are provided in EES Chapter 22: *Community & stakeholder engagement* (AECOM, 2023c).

6. Obligations of the EP Act

6.1. Principles of the EP Act

EPA has eleven principles of environment protection (‘principles’) as listed in Part 2.3 of the EP Act on which they must operate. The applicant must demonstrate that their proposal incorporates technologies, practices and other measures are capable of meeting each of these principles. The principles are listed below with responses for the Goschen Mineral Sands and Rare Earths Project:

Principle	Principle description	Summary of project response	Sections in this report that principle is addressed
Integration of environmental, social and economic considerations	Environmental, social and economic considerations should be effectively integrated	Environment, social and economic considerations formed part of the design of the sewage treatment plant and power station. The EES, inclusive of the assessment of sewage treatment and the power station as necessary, provides a clear, objective and well-integrated analysis of the potential environmental, social and economic considerations of the proposed Project.	Section 7
Proportionality	A decision, action or thing directed towards minimising harm or a risk of harm to human health or the environment should be proportionate to the harm or risk of harm that is being addressed	An environmental, social and economic issues risk assessment was used to prioritise and focus the proposed investigations, assessments and approaches to avoiding, minimising or managing potential impacts. Detailed technical work was undertaken to confirm the extent and severity of potential impacts and to propose mitigation measures proportionate to the risk of harm to human health or the environment.	Section 7
Primacy of prevention	Prevention of harm to human health and the environment is preferred to remedial or mitigation measures	The Project has applied the mitigation hierarchy to identify measures to primarily avoid impacts where possible. Key measures to prevent harm to human health and the environment includes the incorporation of best available techniques or technologies.	Section 7 Section 8
Responsibility shared by all levels of Government and industry, business, communities and the people of Victoria		The EES process enables input on the Project and proposed mitigation measures from the technical reference group (TRG) of state government agencies, local government councils and relevant authorities. The consultation conducted for	Section 5

Principle	Principle description	Summary of project response	Sections in this report that principle is addressed
		the Project included various stakeholder groups, including local residents, business and industry, community and interest groups and Traditional Owners and indigenous groups. This wide engagement has allowed for VHM to share details on the proposal to provide transparency on the Project, including the sewage treatment plant and power station, and VHM's environmental responsibilities.	
Polluter pays	Persons who generate pollution and waste should bear the cost of containment, avoidance and abatement	VHM will address and manage pollution and waste generated by the Project. Land used by the project would be rehabilitated to support an appropriate land use and land form.	Section 10
Waste management hierarchy	Waste should be managed in accordance with the following order of preference, so far as reasonably practicable: • avoidance • reuse • recycling • recovery of energy • containment • waste disposal.	Treated effluent from the sewage treatment plant would be recycled and mixed with raw processing water sourced from Kangaroo Lake for use as part of mineral processing. Measures to minimise the infiltration of tailings water to groundwater would be implemented to minimise impacts to the quality and quantity of the groundwater environment. During operation of the Project, tailings water recovery would be optimised as much as practicable to minimise seepage to the underlying aquifer.	Section 7
Evidence-based decision making	Actions or decisions under this Act should be based on the best available evidence in the circumstances that is relevant and reliable	Potential environmental, social and economic impacts have been identified, assessed and mitigated using evidence-	Section 7

Principle	Principle description	Summary of project response	Sections in this report that principle is addressed
		based decision making as part of the EES process.	
Precautionary	If there exist threats of serious or irreversible harm to human health or the environment, lack of full scientific certainty should not be used as a reason for postponing measures to prevent or minimise those threats	For all specialist studies, where information was not available, a pre-cautionary or 'worst-case' scenario was used in lieu of final operational data.	Section 7
Equity	• All people are entitled to live in a safe and healthy environment irrespective of their personal attributes or location. • People should not be disproportionately affected by harm or risks of harm to human health and the environment. • The present generation should ensure the state of the environment is maintained or enhanced for the benefit of future generations.	The EES studies assessed the potential to harm human health and the environment from sewage treatment and power station activities. Mitigation measures have been proposed to ensure that the state of the environment is maintained and would not cause irreversible damage.	Section 7
Accountability	Members of the public should: • have access to reliable and relevant information in appropriate forms to facilitate a good understanding of issues of harm or risks of harm to human health and the environment and of how decisions are made under the Act; and • be engaged and given opportunities to participate in decisions made under the Act, where appropriate to do so; and • have their interests taken into account in decisions made under the Act.	The EES process has enabled relevant information to be provided to members of the public to facilitate a good understanding of the issues of harm or risks of harm to human health and the environment from the operation of the Project. This process provides opportunities for members of the public to provide feedback and raise issues, which have been considered in the design process and formation of mitigation measures.	Section 5

Principle	Principle description	Summary of project response	Sections in this report that principle is addressed
Conservation	Biological diversity and ecological integrity should be protected for purposes that include the protection of human health.	Where appropriate, mitigation measures and monitoring have been proposed to protect biological diversity and ecological integrity of the environment surrounding the Project.	Section 7

6.2. General Environmental Duty

Central to the EP Act is the General Environmental Duty (GED). The GED is an ongoing duty to prevent the risk of harm to human health and the environment. According to Section 25(1) of the EP Act, the GED requires that a person or entity who is engaging in an activity that may give rise to risks of harm to human health or the environment, to minimise those risks, so far as reasonably practicable.

When determining what is reasonably practicable, Section 6(2) of the EP Act gives regard to the following:

- the likelihood of those risks eventuating
- the degree of harm that would result if those risks eventuated
- what a person concerned knows, or ought reasonably to know
- the availability and sustainability of ways to eliminate or reduce risks
- the cost of eliminating or reducing risks.

Satisfaction of the GED requires a proactive approach to risk identification, assessment and the implementation of controls to minimise impacts to human health and the environment so far as is reasonably practicable. Section 7 of this DL application identifies the potential impacts to human health and the environment from the operation of the Project and the mitigation measures to minimise potential impacts so far as is reasonably practicable.

Section 25(4) of the EP Act specifies five broad areas of risk control. Table 9 summarises each of the five broad areas of risk control and where in the DL application and EES they are addressed.

Table 9 Broad areas of risk control

Broad areas of risk control	Where it is addressed
Use of plant, equipment, processes and systems to eliminate or minimise risk	Section 7 *Environmental assessments* Section 8 *Best available techniques and technology*
Ongoing and systematic identification and evaluation of risks to identify further risk	Section 7 *Environmental assessments* Technical Report G: Air quality impact assessment (SLR, 2023a) Technical Report F: Noise and vibration impact assessment (SLR, 2023b)
Control measures	Section 7 *Environmental assessments* Technical Report G: Air quality impact assessment (SLR, 2023a) Technical Report F: Noise and vibration impact assessment (SLR, 2023b)
Incident response systems	Section 10 *Decommissioning* Section 11 *Environmental management during operation* Chapter 21: *Environmental Management Framework* (AECOM, 2023b)
Substance handling, management and transport	Section 8 *Best available techniques and technology*
Provision of information, instruction, supervision and training to any person	Chapter 21: *Environmental Management Framework* (AECOM, 2023b)

Broad areas of risk control	Where it is addressed
engaging in the activity to enable those persons to comply with the GED	

6.3. Environment Reference Standard

Under the EP Act, the ERS provides the indicators and objectives needed to support environmental values. The ERS is a reference tool and does not set compliance limits or specific obligations that must be followed.

The ERS is a tool that can be used to assess the impacts on human health and the environment that may result from a proposal or activity. This application of the ERS must be seen within the context of the GED and preventing harm from pollution and waste as part of the broader environment protection framework under the EP Act. Because it is preventative in nature, this framework seeks to maintain environmental values and minimise risks of harm to human health and the environment, rather than setting and authorising acceptable levels of pollution and waste. The focus on prevention allows for continual improvement in managing these risks as knowledge expands and more effective risk-reduction techniques and technologies emerge.

The ERS covers the following aspects of Victoria's environment, all of which are relevant to the EES and this DL application:

- Part 2 – Ambient air (refer to Section 7.3 and Technical Report G: Air quality impact assessment [SLR, 2023a])
- Part 3 – Ambient sound (refer to Section 7.4 and Technical Report F: Noise and vibration impact assessment [SLR, 2023b])
- Part 4 – Land (refer to Section 7.6 and Technical Report I: Groundwater impact assessment [CDM Smith, 2023]); and
- Part 5 - Water (The proposed activity does not involve an emission or discharge to surface water)

7. Environmental assessments

7.1. Supporting EES documentation

An EES has been prepared for the Project under the *Environment Effects Act 1978 (Vic)*. The EES has been prepared in accordance with the scoping requirements and relevant legislation, policy and guidelines and has been informed by the environmental impact assessments and specialist studies completed for the EES. This DL application has been informed by the EES and the supporting specialist studies prepared for the project.

The EES chapters and associated specialist studies that were used to prepare this DL application include the following (refer to Section 12):

- Chapter 3: *Project description* (AECOM, 2023a)
- Chapter 21: *Environmental management framework* (AECOM, 2023b)
- Chapter 22: *Community & stakeholder engagement* (AECOM, 2023c)
- Technical Report F: *Noise and vibration impact assessment* (SLR, 2023b)
- Technical Report G: *Air quality impact assessment* (SLR, 2023a)
- Technical Report H: *Surface water impact assessment* (Water technology, 2023)
- Technical Report I: *Groundwater impact assessment* (CDM Smith, 2023)
- Technical Report J: *Geotechnical impact assessment* (Pitt&sherry, 2023a)
- Technical Report P: *Rehabilitation and closure* (Pitt&sherry, 2023b)

A summary of the integrated environmental impact assessments and their relevance to the Environment Reference Standard (ERS) and Principles of the EP Act are provided in Sections 7.2 to 7.7 .

7.2. Climate change

7.2.1. Climate change risk to the project

This section discusses the potential impacts of climate change on the Project and on sewage treatment and power generation activities. This section is based on the climate change modelling undertaken as part of EES Technical Report H: Surface water impact assessment (Water technology, 2023) where potential changes to surface water inundation patterns and runoff pathways, as a result of climate change, were assessed.

Using existing environmental data, regional catchment inundation modelling determined that the Project area would not be affected by riverine flooding and a 1% Annual Exceedance Probability (AEP). Modelling indicated that the 1% AEP event does not produce major external overland flow paths entering or exiting the Project area, with most inundation caused by relatively minor overland flow or a series of discontinuous depressions. There are no major overland flow paths leading directly from the Project area to downstream water environments (including the Murray and Avoca Rivers and Kerang Wetlands Ramsar site). Partial inundation of up to 0.2 m was modelled at the proposed mine pit site in Area 1 during a 1% AEP event, due to local topographic depressions. Area 3 was determined to not be impacted by inundation.

To model potential changes to surface water inundation patterns and runoff pathways as a result of climate change, a climate change projection model was used. The Project would be located in the “Murray Basin Climate Zone” according to the Bureau of Meteorology (BoM) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) classifications. There are a set of 40 global climate projection models used to assist in the analysis and representation of future temperature, evaporation, and rainfall. These models relate results to the Representative Concentration Pathway (RCP) projections and the specific locations throughout Australia. There are predictions for four RCPs, these are as follows:

- RCP8.5 - a future with little curbing of emissions, with a carbon dioxide (CO_2) concentration continuing to rapidly rise, reaching 940 parts per million (ppm) by 2100.
- RCP6.0 – lower emissions, achieved by application of some mitigation strategies and technologies. CO_2 concentration rising less rapidly (than RCP8.5), but still reaching 660 ppm by 2100 and total radiative forcing stabilising shortly after 2100.
- RCP4.5 - CO_2 concentrations are slightly above those of RCP6.0 until after mid-century, but emissions peak earlier (around 2040), and the CO_2 concentration reaches 540 ppm by 2100.
- RCP2.6 - the most ambitious mitigation scenario, with emissions peaking early in the century (around 2020), then rapidly declining. Such a pathway would require early participation from all emitters, including developing countries, as well as the application of technologies for actively removing carbon dioxide from the atmosphere. The CO_2 concentration reaches 440 ppm by 2040 then slowly declines to 420 ppm by 2100) (Detlef P. van Vuuren et. al. (2011), The representative concentration pathways: An Overview).

Given the uncertainty about which RCP scenario would be relevant in the future, RCP 8.5 was modelled for the Project. Modelling of the RCP 8.5 demonstrated the worst case of the four options.

Climate change modelling undertaken by EES Technical Report H: Surface water impact assessment (Water technology, 2023) indicated that increased rainfall under the climate change scenario generally brought about greater flooding depths and a greater inundation extent. Despite this, no overall change to inundation patterns or runoff pathways were observed.

As discussed in EES Technical Report H: Surface water impact assessment (Water technology, 2023), the location of the Project would avoid inundation from waterways. Despite this, inundation of the Project area could be caused by surface water runoff within the local catchment. Inundation of the Project area could cause damage to infrastructure and disrupt mining operations, which could be halted during dewatering and recovery works. Inundation could also lead to the transport of contaminants offsite.

To mitigate risks of inundation, access routes would be designed to maintain access to mine sites and associated infrastructure with flood depths below 300 mm during construction and maintenance operations. Any infrastructure within the 1% AEP storm extent would be designed to withstand potential flooding and would be subject to compliance with the specific requirements of the North Central and Mallee Catchment Management Authority's (CMA) floodplain works approval process. Compliance with specific requirements of the CMA floodplain works approval process is required.

Additionally, surface water basins within Project Area 1 and Area 3 would be designed to capture surface water runoff from 5% AEP events with any runoff generated above this (i.e. 1% AEP events) to be directed into the open mine pit. This means that the Project would be largely unaffected by surface water runoff from significant rainfall events.

To assess potential climate change impact to groundwater, the Department of Environment Land Water and Planning (now referred to as the Department of Energy, Environment and Climate Action (DEECA)) guideline for Assessing the Impact of Climate Change on Water Availability in Victoria (2020) was reviewed. The guideline lists the requirements to determine an aquifers sensitivity to climate change as follows:

- The aquifer is sedimentary and unconfined with a depth to groundwater of less than 20 m bgl.
- The aquifer is highly responsive to rainfall and/or changes in stream flows.

Based on the available data, the Loxton Parilla Sands aquifer is unlikely to be sensitive to climate change. Beneath the mining areas, the depth to groundwater is approximately 48 m bgl. Long term hydrographs plotting annual rainfall and groundwater elevation in three WMIS groundwater bores indicate that the groundwater table does not respond to rainfall events and is very stable (refer to Technical Report I: *Groundwater impact assessment* (CDM Smith, 2023)).

Further information is provided in EES Technical Report H: Surface water impact assessment (Water technology, 2023) and EES Technical Report I: *Groundwater impact assessment* (CDM Smith, 2023).

7.3. Air emissions

This section summarises the impacts on air quality detailed in Technical Report G: *Air quality impact assessment* (SLR, 2023a). The air quality technical report has undergone Technical Reference Group review (which includes EPA) to ensure that the report adequately addresses the matters set out in the scoping requirements and to ensure that the study sufficiently examines and clearly documents the potential environmental impacts related to the Project and operation of the power station. Air emissions not directly related to the activity of power generation, such as construction activities, will not be discussed further in this DL application.

The relevant risks from Section 9 and Appendix A of (SLR, 2023a) are presented in Table 10 below.

Table 10 Air quality risks

Risk ID	Potential Threat and Effects on the Environment	Initial risk rating
O11	Diesel/LPG power station emissions to air impacting at sensitive receptors	Low
O12	Diesel/LPG power station emissions to air impacting locations at or beyond site boundary (occasional human receptor, continuous vegetation)	Medium

Following the measures and controls specified in Section 7.3.2, risk of harm to human health and the environment from power station emissions is considered to be minimised to the extent practicable.

7.3.1. Summary of air impacts on human health and the environment

While the power station would use dual fuel generators, the use of diesel fuel has been assessed as the base case for the air quality impact assessment. This is due to market availability and certainty of supply.

The following table presents the parameters of the power station. Greenhouse gas (GHG) emissions have been estimated considering both diesel and LNG fuel scenarios during year two operations. For comparison, estimated GHG emissions from grid supplied electricity has been included.

Table 11 Power station parameters

Parameter	Units	Value
Model	-	Cummins KTA50-G9
Number	-	12 with two standby (14 in total)
Mechanical generation capacity: individual continuous power	kW_m	850
Mechanical generation capacity: combined continuous power	KW_m	12,000
NOx emission at rate continuous power	g/kWh	7.2
	g/s	2.0 per generator
PM emission at rate continuous power	g/kWh	0.045
	g/s	0.012 per generator
Fuel rate at continuous power	L/h	299 per generator, 3,588 combined
Exhausts per generator	-	2
Exhaust temperature	C	470
Exhaust stack exit height	m	8.4
Exhaust stack inside diameter	m	0.762 (at exhaust)
Gas flow rate per generator	m^3/s	4.53

Parameter	Units	Value
Gas exit velocity (vertical) per stack	m/s	5.0
Generator building dimensions (downwash)	m	62.5 x 10.5 x 6 (L x W x H)
Annual GHG emissions (diesel)*	tCO2-e	23,727
Annual GHG emissions (LNG)*	tCO2-e	17,215
Annual GHG emissions (grid electricity)*	tCO2-e	29,186

*Note: * - National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Measurement Determination)*

During operation of the power station, pollutants that would be emitted to air include the following:

- Carbon monoxide (CO).
- Oxides of nitrogen (NO_x).
- Particulate matter (PM_{10} and $PM_{2.5}$).
- Sulfur dioxide (SO_2).
- Volatile organic compounds (VOCs).
- Polycyclic aromatic hydrocarbons (PAHs).

Carbon monoxide is an odourless, colourless gas formed from the incomplete burning of fuels. It can be a common pollutant at the roadside and highest concentrations are typically found in the kerbside environments with concentrations decreasing rapidly with increasing distance from the road.

In atmospheric chemistry, NO_X generally refers to the total concentration of nitric oxide (NO) and nitrogen dioxide (NO_2). NO is a colourless and odourless gas that does not significantly affect human health. However, in the presence of oxygen, NO can be oxidised to NO_2 which can have significant health effects including damage to the respiratory tract and increased susceptibility to respiratory infections and asthma. NO will be converted to NO_2 after leaving the combustion source at a rate dependent on ambient and atmospheric conditions.

Particulate matter has the capacity to affect human health and to cause nuisance effects and is categorised by size and/or by chemical composition. The potential for harmful effects depends on both. In air quality assessments, particulate size ranges are commonly described as:

- TSP – refers to all (total) suspended particles in the air. In practice, the upper size range is typically 30 micrometres (µm) to 50 µm.
- PM_{10} – refers to all particles with equivalent aerodynamic diameters of less than 10 micrometres.
- $PM_{2.5}$ – refers to all particles with equivalent aerodynamic diameters of less than 2.5 micrometres. These are often referred to as ‘fine’ particles and are a sub-component of PM_{10}.

Fine particles, or PM2.5, are derived primarily from combustion processes, such as vehicle emissions, wood burning, gas, diesel or coal burning for power generation, hazard reduction burns and bush fires. Fine particles also consist of transformation products, including sulphate and nitrate particles, and secondary organic aerosols formed from volatile organic compound emissions.

The size of particles determines their behaviour in the respiratory system, including how far the particles are able to penetrate, where they deposit, and how effective the body's clearance mechanisms are in removing them. Additionally, particle size is an important parameter in determining the residence time and spatial distribution of particles in ambient air, which are key considerations in assessing exposure.

Sulfur in fuel converts to sulfur oxides during combustion, hence emissions of SO_2 are directly related to the concentration of sulfur in the fuel. Diesel contains more sulfur than gas, as there is negligible sulfur content in Australian natural gas.

VOCs have high vapour pressure at normal room-temperature conditions. Their high vapour pressure leads to evaporation from liquid or solid form and emission release to the atmosphere. VOCs are emitted by a variety of sources, including motor vehicles and other stationary and mobile engines. VOCs that are often typical of these sources include benzene, toluene, ethylbenzene and xylenes (often referred to as 'BTEX').

PAHs typically result from the incomplete combustion of organic material (such as coal, petrol, diesel, and wood). PAHs are toxic and carcinogenic, the degree to which is dependent on the type of PAH. PAHs typically occur in mixtures and it is therefore difficult to establish the risk that that the mixture may pose. The toxicity of a mixture of PAHs is therefore often expressed as a single number representing the equivalent concentration of the most toxic or carcinogenic congener, benzo(a)pyrene (B(a)P).

The rate and composition of air pollutant emissions from the power station would be a function of a number of factors, including the type and size of the generators, operational load and inclusion of emissions controls (e.g. low-NO_X burners). For diesel fired generators, the pollutants with the highest emission rates relative to their ambient air quality criteria, and therefore the pollutants with the highest risk of exceeding that criteria are NO_2 and $PM_{2.5}$. The air quality impact assessment therefore considered only emissions of NOx and $PM_{2.5}$ from the power station, the rationale being that if meeting the requirements of the GED with respect to NO^{-}_{2-} and $PM_{2.5}$ is demonstrated, meeting the requirements of the GED with respect to the other pollutants would also be implicitly demonstrated.

7.3.1.1. Nitrogen dioxide and $PM_{2.5}$ emissions

Emissions from the 12MW power station were estimated based on it comprising 12 duty and two standby 0.85 MWm diesel generators. The generators are to be housed in a single building, each serviced by an individual exhaust stack. To achieve the power requirements, the 12 duty diesel generators would target operating between 70-90% of full load for optimal efficiency. For modelling purposes in the air quality impact assessment, the continuous power rating generator specifications were used.

Based on modelling undertaken in the air quality impact assessment, predicted cumulative NO_2 ground level concentrations at the Project boundary were (refer to Section 11.3.6 of the Air quality impact assessment [SLR, 2023a]):

- 957 ug/m3 maximum (99.9th percentile) 1 hour cumulative average NO_2 concentration.
- 63 ug/m3 annual cumulative average NO_2 concentration.

The maximum predicted Project 24-hour average $PM_{2.5}$ ground level concentrations ranged between 0.061 ug/m^3 and 0.65 ug/m^3 for off-site receptors. The maximum annual average $PM_{2.5}$ concentration ranged between 0.0027 ug/m^3 and 0.026 ug/m^3.

It was found that the predicted maximum NO_2 ground level concentrations at or beyond the site boundary resulting from the power station emissions exceeded the 1-hour human health criterion and the annual average vegetation criterion. Modelling indicated that exceedances of the health criterion extend to between 500 and 800 m from the site boundary into the surrounding field and exceedances of the vegetation criterion extend to approximately 50 m from the site boundary. $PM_{2.5}$ ground level concentrations resulting from power station emissions to air are negligible at nearby receptors such that cumulative concentrations are unlikely to be increased by a measurable amount.

The geographical extent that the power station ground level concentrations are predicted to exceed the NO_2 1-hour criterion is limited to areas which would seldomly be occupied by members of the public, including farmers and the potentially impacted land is a neighbouring field with no public access.

While the geographical extent to which the emissions from the power station are predicted to exceed the annual average criterion relating to vegetation is not large, it does suggest that there may be some detrimental effects to those areas, especially where the impact may be to an area of cropland. The annual average criterion relating to human health is not applicable in this area due to the absence of human receptors over this length of time.

It is also noted that the siting of the power station may shift 120 m to the east. If this is the case, it is expected that NO_2 impacts beyond the site boundary would be reduced.

With the implementation of mitigation measures (refer to Section 7.3.2), risk of harm to human health and the environment from power plant emissions is considered to be minimised to the extent practicable.

7.3.1.2. Odour

Odour emissions are considered to be minimised to the extent practicable.

Regarding the sewage treatment plant, the design of the plant itself addresses any potential odour issues that would arise in an unmixed, unaerated raw sewage balance tank. This is achieved via the integration of the anoxic flow balance tank with the SBRs in aeration mode. Other odour emissions are not anticipated given that the sewage treatment plant would consist of sealed containment tanks and recycled water would be used within a closed, industrial process (refer to Section 2.3.2)..

Nonetheless, the nearest resident (R0013) is approximately 1.6 km west of the proposed plant (refer to Section 2.1.1.2). EPA Publication 1518: Recommended separation distance for industrial residual air emissions (EPA, 2013) and draft EPA Publication 1949: Separation distance Guideline (EPA, 2022) both provide the same separation distance for odour emissions from wastewater treatment plants based on the size of the population they serve. The maximum separation distance depending on the type of installation for a Site population is 316 m.

In order to minimise odour emissions, the sewage treatment plant would consist of sealed containment tanks demonstrating best practice design and recycled water would be used within a closed, industrial process.

7.3.2. Compliance of air emissions with GED and ERS

To minimise emissions from the power station to the extent practicable in accordance with the GED, emissions reduction technology, such as selective catalytic reduction (e.g. AdBlue), would be implemented. Selective catalytic reduction is an advanced emissions control technology that reduces NOx emissions by approximately 90%. Selective catalytic reduction uses ammonia to react with NOx, converting NOx pollutants into nitrogen and water.

In addition to this measure, the most up to date and efficient equipment (e.g. Cummins KTA50 or equivalent) would be installed and all related equipment would undergo regular maintenance as per manufacturer's specifications.

The dual fuel system also provides opportunity to further reduce emissions, by allowing for reduced diesel usage, however it is noted that the air quality impact assessment has considered the use of diesel fuel as a base case given market availability and certainty of supply.

During operation of the power station, air monitoring would be to monitor emissions. A Project specific air quality monitoring plan would be developed to:

- Set out monitoring responsibilities of staff and contractors.
- Identify air quality indicators to be monitored.
- Establish monitoring criteria for the air quality indicators.
- Identify nearby sensitive receptors with the greatest potential to be impacted by emissions from the Project.
- Set out appropriate air quality monitoring methods, schedules and reporting requirements.

To further reduce emissions, it is a commitment by VHM that assessment and planning on a grid connection will commence as soon as practicable, with an aim to have the mine site supplied predominantly by renewable power sources within 5 years of the commencement of operations.

Further information is provided in Technical Report G*:* Air quality impact assessment (SLR, 2023a) and Chapter 21: Environmental Management Framework (AECOM, 2023b).

7.3.3. Proposed licence limits

Proposed air discharge licence limits for the power station are presented in Table 12 below. The licence limits consider a base case diesel fuel supply for the power station using emissions from Table 11 and apply a 50% buffer to allow for the management of unplanned events.

Table 12 Proposed licence limits

Substance	Operating scenario	Total emissions (g/s per generator)	Bubble licence limit* (g/min for all generators)
NOx	Diesel fuel	2	2,160
PM2.5	Diesel fuel	0.012	13

Using AdBlue fuel would result in reduced NOx emissions. Under this operating scenario, a licence limit of 330 g/min would be proposed.

7.4. Noise emissions

Preparation of this section of the DL application was based on information provided in the EES Technical Report F: Noise and vibration impact assessment (SLR, 2023b). The noise and vibration technical report has undergone Technical Reference Group review (which includes EPA) to ensure that the report adequately addresses the matters set out in the scoping requirements and to ensure that the study sufficiently examines and clearly documents the potential environmental impacts related to the Project and operation of the power station.

The relevant risks from Section 8 and Appendix A of (SLR, 2023b) are presented in Table 13 below.

Table 13 Noise risks

Risk ID	Potential Threat and Effects on the Environment	Initial risk rating
O1	Excessive noise generation from fixed processing plant, power station and pumping station equipment	Very high

Following the measures and controls specified in Section 7.4.2, risk of harm to human health and the environment from power station emissions is considered to be minimised to the extent practicable.

7.4.1. Summary of noise impacts on human health and the environment emissions assessment

Operational noise produced by the power station was identified as having potential to result in adverse impacts to nearby sensitive receptors.

Broadband exhaust and case breakout noise for the proposed diesel generator model KTA50-G9 was provided by the manufacturer, Cummins. Since the frequency data was not provided, empirical spectra for exhaust and casing noise was adopted from Bies and Hansen and offset to match the Cummins overall levels. See Table 14 below.

Each engine would be located inside a drop over acoustic enclosure. The acoustic enclosure is such that achieves a weighted sound reduction index of Rw 25. The diesel engine enclosures are situated inside a structure. The reverberant sound pressure level was calculated from the building volume and estimated reverberation time.

Engine exhaust noise were modelled as point sources at an elevation of 8m. The powerplant building was modelled as an industrial building with casing noise breakout through the building façade.

The modelled power station sound levels are also presented in Table 14 below (refer to Section 6.6.3 of Noise and vibration impact assessment [SLR, 2023b])

Table 14 Sound level summary

Quantity	Equipment	Octave band linear sound power level (Leq),dB per unit								OA
		63	125	250	500	1k	2k	4k	8k	
10	Cummins KTA50-G9 Exhaust	140	146	142	134	130	124	114	106	138
10	Cummins KTA50-G9 Casing noise	108	115	115	114	116	115	109	102	120
-	Power station exhaust	102	93	90	89	87	81	71	63	91
-	Power station, internal Lp, rev	73	80	79	78	80	79	71	63	84*

Note: * - internal reverberant sound pressure level

Noise emissions were predicted and assessed to the requirements of the noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues, (EPA Publication 1826). The power station is anticipated to be operating continuously 24/7 and would represent a significant source of noise emissions. The Project should incorporate the highest levels of noise control for the power station including, placing all gensets in acoustic enclosures and containing all gensets within a generator building, use of high-performance exhaust mufflers and low noise cooling radiators. The objective would be to reduce power station noise as far as practicable.

During mining operations, it was determined that the power station would contribute up to 26 dBA of noise at nearby sensitive receptor R0013 and up to 23 dBA of noise at nearby sensitive receptor R0014 prior to the implementation of mitigation measures (refer to Section 10.1 and 10.2 of Noise and vibration impact assessment [SLR, 2023b]). As discussion in Section 2.1.1.2, R0014 has been acquired and is not considered a sensitive receptor. R0013 is a residential property and is considered a sensitive receptor.

With consideration to night time noise limits specified in EPA Publication 1826, noise emissions from the power station (26 dBA) would be below the night time noise limit at R0013 (36 dBA). For all remaining residential properties identified as sensitive receptors (R001 to R0017, refer to Section 2.1.1.2), noise emissions from the power station are predicted to be less than 20 dBA.

To assess impacts to natural areas, predicted noise levels have been considered against the Category IV indicators and objectives in the ERS relating to Public Conservation and Resource Zone (PCRZ) areas at Talgitcha Bushland Reserve (4 km south east of the processing facility) and Lalbert Recreation Reserve (6 km south west of the processing facility).

Table 15 Predicted noise levels against Category IV indicators

Receiver type	Category	Predicted noise level dBA	ERS objective noise level dBA
Lalbert Recreation Reserve	IV	25	35
Talgitcha Bushland Reserve	IV	34	35

Predicted noise from the Project is not expected to exceed the ERS objective noise levels for the Category IV land use (PCRZ) zones of Lalbert Recreation Reserve and Talgitcha Bushland Reserve.

With the implementation of mitigation measures (refer to Section 7.4.2), risk of harm to human health and the environment from power plant emissions is considered to be minimised to the extent practicable.

7.4.2. Compliance of noise emissions with GED and ERS

In order to minimise noise emissions to the extent practicable in accordance with the GED, controls to manage noise from the operation of the power station would include (but are not be limited to) the following:

- Ensuring all plant, equipment and vehicles are fitted with appropriate noise attenuation devices as per manufacturer specification (e.g. enclosures, baffles, silencers, mufflers etc.) and all equipment is maintained in good repair.
- Develop and implement a strategy for optimising the placement and configuration of overburden stockpiles so as to provide additional noise screening to nearby receptors from noisier activities.
- The project shall incorporate the highest levels of noise control for the power station including, placing all gensets in acoustic enclosures and containing all gensets within a generator building, use of high-performance exhaust mufflers and low noise cooling radiators.
- Risk of low frequency noise impacts from the power plant will be controlled by the highest levels of noise control including, placing all gensets in acoustic enclosures within a generator building, use of high performance mufflers and low noise cooling radiators.

Further mitigation measures to be considered during detailed design of the Project include the relocation of residents out of the impacted off-site sensitive receptor, whilst mine operations impact on the property.

In addition, a Noise Management Plan would be developed, which would formally document all of the managerial and engineering measures to be implemented to control noise from the Project. The Noise Management Plan ensures that the risk of harm from noise would be minimised so far as reasonably practicable, consistent with the GED, throughout all stages of the project.

The Noise Management Plan would include a comprehensive Noise Monitoring Programme which would be implemented to determine if compliance with the relevant noise criteria is maintained throughout the full duration of the Project, the effectiveness of noise mitigation and management measures, as well as highlight the most significant sources of noise to receptors and any opportunity to reduce them further.

Further information is provided in Technical Report F*:* Noise and vibration impact assessment (SLR, 2023b) and Chapter 21: Environmental Management Framework (AECOM, 2023b).

7.5. Water

The proposed activity does not involve an emission or discharge of water.

During operation of the Project, all surface water runoff would be captured and there would be no discharge of surface water from the Project. Project Area 1 and Area 3 would be designed to capture surface water runoff from 5% AEP events with any runoff generated above this (i.e. 1% AEP events) to be directed into the open mine pit. Surface water discharge would only occur from land yet to be disturbed by mining activities and from land that has been successfully rehabilitated as per the rehabilitation objectives and completion criteria (refer to Section 10).

Figure 13 below presents the modelled catchment basins for Area 1. Basin catchment areas and volumes are summarised in Table 16.

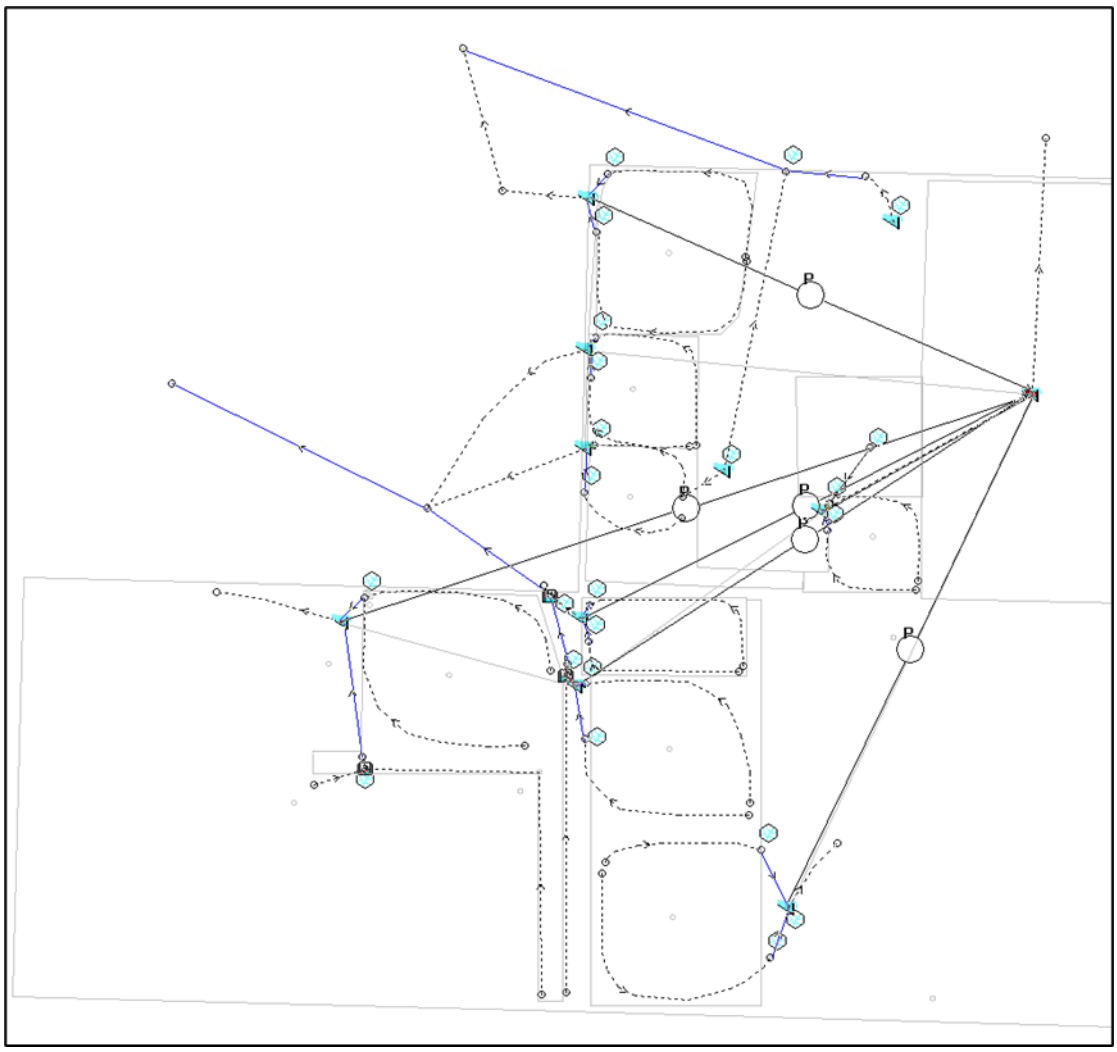

Figure 13 Area 1 modelled catchment basins

Table 16 Area 1 catchment area and catchment volumes

Basin ID	Catchment area (ha)	5% AEP basin volume (m^3)
Basin A	39.3	17,000
Basin B	73.8	30,500
Basin C	26.5	10,400
Basin D	13.2	4,800
Basin G	17.2	6,600
Basin H	12.6	4,700
Basin I	24.6	9,400
Basin L	24.7	13,800

Figure 14 below presents the modelled catchment basins for Area 1. Basin catchment areas and volumes are summarised in Table 17.

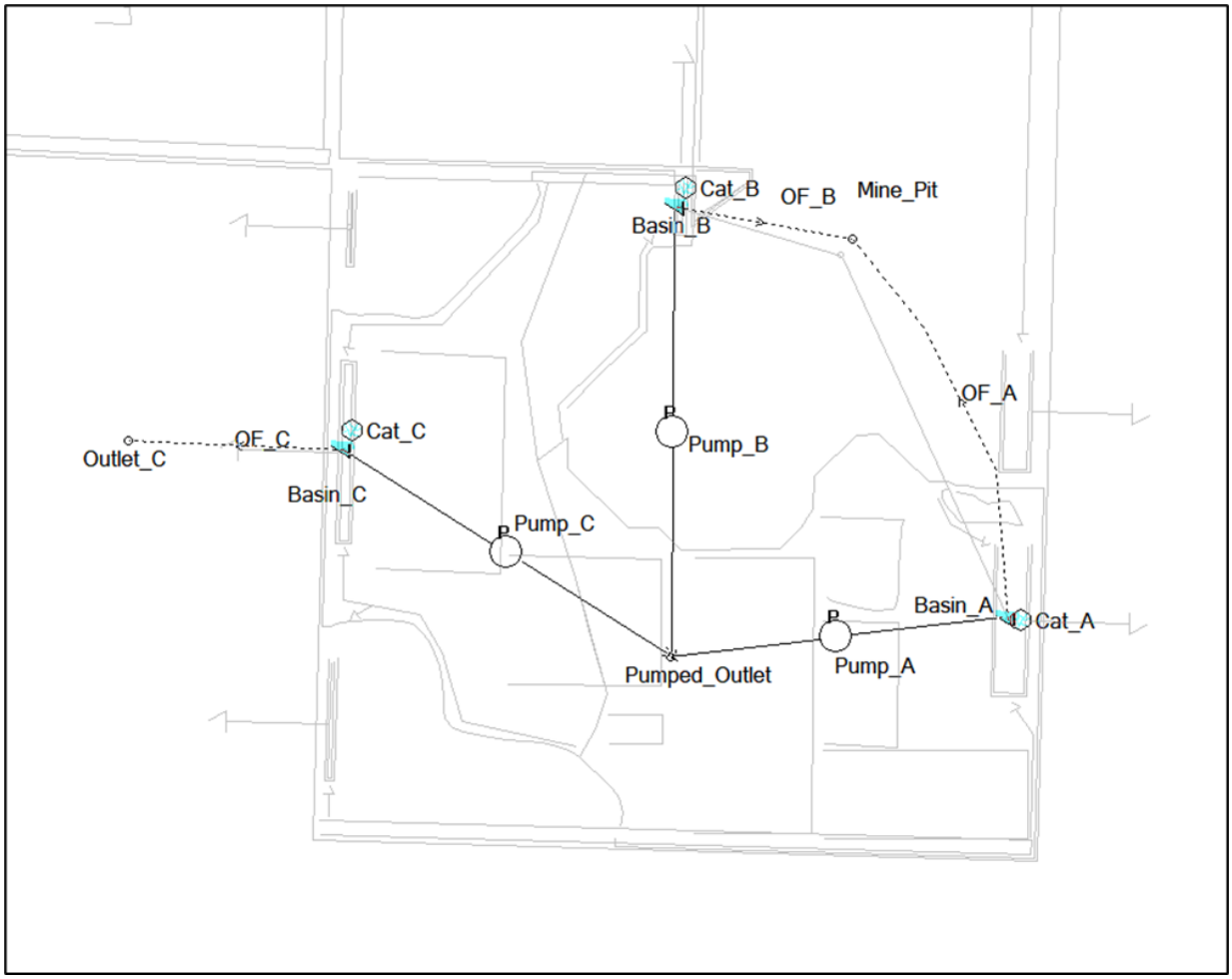

Figure 14 Area 3 modelled catchment basins

Table 17 Area 3 catchment area and catchment volumes

Basin ID	Catchment area (ha)	5% AEP basin volume (m3)
Basin A	170	80,100
Basin B	27	12,200
Basic C	102	47,800

7.6. Land and groundwater

7.6.1. Summary of groundwater impacts

Sewage would be treated via a sequencing batch reactor based multi-staged system, as described in Section 2.3.2. It is proposed that treated effluent would be mixed with raw process water sourced from Kangaroo Lake and recycled to the water circuit on site. The steady state water requirement for Project operation would be 3.1 GL/year. As such, treated effluent from the sewage treatment plant would make up less than 0.5% of the water used within mineral processing. A draft Health Environment Management Plan (HEMP) has been prepared to identify the potential risks to human health and the environment associated with the reuse of treated effluent for mineral processing (refer to Appendix B).

Solids separated during sewage treatment would be removed from site and disposed of at a facility authorised to receive the waste, by a suitably licenced contractor. The sewage treatment plant would conform with the relevant Australian and New Zealand standards, namely:

- AS 1546.3:2017, On-site domestic wastewater treatment units, Part 3: Secondary treatment systems

During operation of the Project, pits would be excavated and mined, and ore would be processed. As part of the Project's progressive rehabilitation, the resultant tailings would be deposited in pit where it was conservatively assumed that they would be 50% saturated with water from mineral processing. This conservative assumption was adopted for modelling purposes by the groundwater impact assessment (CDM Smith, 2023). As described in Section 1.4, an A18 permit permission would be prepared for the disposal of tailings in-pit during mining operations.

Throughout mineral processing and the deposition of tailings in-pit, tailings water recovery would be optimised as much as practicable. Measures to optimise tailings water recovery would include, thickening during processing, decant on tailings to recover water, solar drying prior to backfill and the inclusion of an in-pit underdrain. These water recovery measures would be captured in a tailings management plan. Water recovered from the tailings would be recycled back to the mineral processing plant to be mixed with raw process water from Kangaroo Lake and Class C treated sewage water.

Any remaining water that is unable to be recovered from the tailings deposited in-pit would seep into the groundwater, however this seepage would be minimised to the extent practicable. Any seepage from deposited tailings may create a localised groundwater mound and may alter the chemistry of the underlying groundwater.

7.6.2. Compliance with GED and ERS

Efforts to minimise any changes to groundwater quantity and groundwater quality would be implemented. During operation of the Project, tailings water recovery would be optimised as much as practicable to minimise seepage to the underlying aquifer. Measures to optimise tailings water recovery would include, thickening during processing, decant on tailings to recover water, solar drying prior to backfill and the inclusion of an in-pit underdrain. These measures would be captured in a Tailings Management Plan.

In addition, a groundwater monitoring program would be developed to monitor groundwater quality in the Project area in accordance with a site-specific Groundwater Management Plan. Bi-annual groundwater monitoring is currently scheduled for a period of two years to develop a pre-mining baseline database for groundwater. During mining operations and rehabilitation, groundwater monitoring is proposed to continue bi-annually. Any changes to groundwater quality due to tailings leachate would be compared against the baseline database. If the ongoing groundwater monitoring detects any impacts to groundwater quality, a review of the groundwater data and mining practices would be undertaken. Further trigger levels and contingency actions would be specified in the site-specific Groundwater Management Plan.

As described in Section 1.4, an A18 permit would be prepared for the disposal of tailings in-pit during mining operations.

7.7. Waste

Sewage solids and sludge separated during sewage treatment and any waste oils from the power station would be considered reportable priority waste in accordance with Schedule 5 of the Environment Protection Regulations 2021.

The storage of diesel and LNG or LPG at the Project to support the power station would be managed as dangerous goods. Diesel and LNG or LPG would be stored within the process plant area in bunded, double skinned above ground storage tanks according to applicable standards with emergency and spill response procedures in place. Appropriate signage and labelling would be provided and current safety data sheets (SDS) for any dangerous good stored would be available. Applicable standards include:

- Australian standard 1940 (Storage and handling of flammable and combustible liquids).
- Dangerous Goods (Storage and Handling) Regulations 2012.

While not considered industrial waste, dangerous goods would become waste if:

- Discharged, emitted or deposited in the environment.

- Considered unwanted, discarded, rejected, abandoned or surplus.

The following table provides a summary of the expected dangerous goods inventory associated with the storage of dangerous goods at the Project:

Table 18 Dangerous goods inventory - storage of fuel

Material	DG Class	HAZCHEM Code	Location	Quantity
Diesel	C1	-	Processing facility, Project Area 1	880 kL
LNG (Liquefied Natural Gas)	2.1	2WE	Processing facility, Project Area 1	160 kL
LPG (Liquified Petroleum Gas)	2.1	2YE	Processing facility, Project Area 1	160 kL

Any industrial waste that is generated during sewage treatment and power generation activities would be managed in accordance with the EP Act, Environment Protection Regulations, any supporting legislation and would consider the GED. It is not expected however, that power generation activities would generate industrial waste, with the exception of waste oils. The Environment Protection Regulations provide detail on how waste should be classified (Schedule 5) and categorised (Schedule 6) where required. Once categorised, waste can only be sent to a place authorised to receive that waste.

Depending on its categorisation or classification, waste may be considered priority waste or reportable priority waste. Both priority waste and reportable priority waste are industrial wastes which require additional controls due to their higher levels of risk to human health and the environment. Reportable priority waste carries the highest level of controls. Duties specific to reportable priority waste include reporting to EPA each time the waste is exchanged (waste tracking) and transport only in permitted vehicles.

Sewage solids and sludge separated during sewage treatment and waste oils from the power station would be considered reportable priority waste. If the dangerous goods used as part of the fuel storage become waste, it would also likely be considered reportable priority waste in accordance with the Environment Protection Regulations 2021. As such these wastes would be managed by an appropriately licensed contractor and taken to a facility authorised to receive the waste. The waste would also be subject to waste tracking and would only be transported by permitted vehicles.

Where relevant, the waste hierarchy would be applied for the minimisation and management of industrial wastes generated as a result of sewage treatment and power generation activities (refer to Figure 15). Sewage solids and sludges and waste oil would be contained appropriately for off-site disposal. Industry standard methods for storing and managing dangerous goods, such as appropriate primary and secondary containment, routine maintenance, inspections and spill prevention would ensure that the generation of waste from fuel storage is avoided and minimised altogether.

During operation of the Project, tailings water recovery would be optimised as much as practicable to minimise seepage to the underlying aquifer. Measures to optimise tailings water recovery would include, thickening during processing, decant on tailings to recover water, solar drying prior to backfill and the inclusion of an in-pit underdrain. These measures would be captured in a tailings management plan. All recovered water would be re-used as part of mineral processing.

Figure 15 Waste hierarchy (EPA 2020)

8. Best available techniques and technologies

8.1. Power station

The Project assumes on-site fuel powered generation, using equipment that can be run on diesel, LNG and/or LPG.

8.1.1. Power supply

VHM's preference is to utilise either local renewable generation suppliers (i.e., wind and solar farms in the region that could supply power directly) and/or enter into a Power Purchase Agreements or other commercial arrangement for the supply of renewable energy. However, both of these alternatives require direct grid connection, and the existing powerlines in the near vicinity of the Project are unable to supply adequate power.

It was determined that inclusion of a powerline in the EES from the project mine site area to a point in the grid, which would provide high reliability, was not feasible for the following reasons:

- Uncertainty on the optimal connection point given the potential future works being currently planned on the network
- Timeline to assess connection point and optimal route and then engage with relevant landowners

For this reason, an on-site power plant is the preferred option for the Project. However, it is a commitment by VHM that assessment and planning on a grid connection will commence as soon as practicable, with an aim to have the mine site supplied predominantly by renewable power sources within 5 years of the commencement of operations.

Key features of the proposed power station include:

- 12 installed Cummins KTA50, 850 kW or equivalent, 11 kV dual fuel generating sets with spare bays for two additional generator sets in an engine shed that is fitted with an overhead crane for maintenance.
- 11 kV witch room with provision for alternative renewable energy inputs and future expansion.
- Fuel storage for diesel and liquefied natural gas (LNG) or liquid petroleum gas (LPG) each with capacity for 10 days operation.
- Power station controls and communications for remote monitoring of the power station.

Equipment selection for the power plant was based on using current generation models that are readily available.

It is expected that 12 of the 14 generators would operate under normal conditions to provide power to the Project's processing facility. The remaining two generators would either be serviced or in standby mode waiting for connection to the other generators. Operators would need to place the generators in standby mode after the regular service. The automated system would manage the entire generator system, switching off individual units when demand for power is low. This would maximise fuel efficiency and operate the generators in a normal operating loading range.

During overhauls or downtime of generator units, power would still be delivered by using the two standby generators. This would ensure reliable power supply is provided for continued 24/7 mining operations.

The power station would have the capability for renewable energy inputs. This would ensure that when renewable energy is readily available and feasible to use for the Project, it can be used as part of Project power supply.

8.1.2. Fuel supply

A dual fuel system (diesel and LPG) was chosen ahead of a single fuel system (diesel). The advantage of a dual fuel system, compared to diesel only, is the opportunity to reduce diesel consumption and mitigate supply issues both in the supply of diesel fuel and gas. Utilising a dual fuel system would result in reduced greenhouse gas emissions through a reduced use of diesel fuel and more efficient engine operations. Additionally, the use of an alternative fuel source, such as liquified petroleum gas (LPG), would result in significantly lower emissions of NOx (and PM2.5).

Where diesel is used, emissions reduction technology, such as selective catalytic reduction (e.g. AdBlue), would be implemented. Selective catalytic reduction is an advanced emissions control technology that reduces NOx emissions by approximately 90%. Selective catalytic reduction uses ammonia to react with NOx, converting NOx pollutants into nitrogen and water.

For the purpose of the air quality impact assessment, the use of diesel fuel has been assessed as the base case with consideration to market availability and certainty of supply.

8.1.3. Noise

Regarding noise impacts, the power station consists of thirteen Cummins KTA50-G9 diesel powered generator sets housed within a building. The building has large opening roller doors on the north and south facades and the eastern façade is also heavily louvered to assist airflow, with exhaust and cooling radiators incorporated into the western façade. The rest of the building construction is assumed to be constructed of galvanised steel or similar, with a weighted sound reduction index Rw+Ctr 23.

To reduce noise breakout from the building as well as to satisfy workplace occupational health and safety requirements (not to exceed internal sound pressure level greater than 85 dBA, each engine would be placed inside 'drop over' acoustic enclosures with a minimum weighted sound reduction index of Rw+Ctr 23. This recommendation is based on preliminary assumptions and subject to detailed design.

High performance exhaust silencers would be installed on the diesel engine exhausts; Maxim MSA55 or equivalent to achieve a 35 dB to 50 dB noise reduction.

8.2. Sewage treatment plant

All wastewater from ablutions and the administrative offices within the process plant area will be treated via SBR that has a design capacity of 20,000 L/day that will discharge Class C recycled water. The treated effluent would be collected and is proposed to be used in the mineral process water circuit. Excess biosolids from the SBR will be pumped out to a 10 m^3 sludge holding tank for thickening and ultimately be disposed of off-site by an EPA licenced contractor.

The sewage treatment plant shall incorporate various current technological recognised and proven processing stages to treat, control and manage the process. The treatment process and all its systems are fully contained and enclosed until discharge of the treated water stream is returned to the plant, and the solids/sludge generated contained until collected by a licenced contractor.

The treated effluent from the sewage treatment plant will be of a quality comparable to the raw processing water sourced from Kangaroo Lake to enable its re-introduction into the mineral processing plant. Treated effluent would re-enter the circuit at the water circuit, else the tailings circuit where it will

be recovered as decant and eventually returned to the water circuit. The steady state water requirement for Project operation would be 3.1 GL/year. As such, treated effluent from the sewage treatment plant would make up less than 0.5% of the water used within mineral processing.

Alternative options included collecting and storing all wastewater for periodic collection from site by a licenced waste contractor and/or a hybrid system where a portion of wastewater is periodically collected from site by a licenced contractor, but administration offices and workshops are treated via an in-ground (septic) system onsite.

The first alternative considered would have removed all wastewater from site with associated additional vehicle movements to and from the Project area compared to the preferred option. The second alternative would treat some effluent onsite using a smaller system but would involve direct discharge to land. Ultimately, the preference would be given to optimise the volume of water re-use on-site.

9. Commissioning / proof of performance

Commissioning plans and performance test criteria shall be established by the Suppliers of the respective packages and agreed in principle by VHM prior to procurement and installation of these systems.

This shall be completed by the constructing EPC contractor as part of completion of the integrated Project. This detail shall be completed early in the project's implementation phase.

10. Decommissioning

The Project would be decommissioned following its approximate 20 to 25 year operation, however during its operation, mined areas would be progressively rehabilitated. The overall objectives of decommissioning and rehabilitation are to ensure that the final landform and land use is safe, stable and non-polluting, and capable of supporting the final land use which is broadacre agriculture.

Decommissioning and rehabilitation should meet all baseline criteria for relinquishment and achievement of the final land use, which is agriculture. Mining is a temporary land use and, following closure of the Project, the disturbed footprint must be left in a self-sustaining and self-managing state that doesn't require ongoing intervention by the landowner.

The proposed post mining land use is agriculture, and this occurs across the area to be disturbed by mining operations, including sewage treatment and power generation activities which are the subject of this DL. The goal of rehabilitation is to restore land disturbed by mining to an equivalent (or better) agricultural land capability to enable a broad range of future agricultural uses.

As described in EES Technical Report P: Rehabilitation and Closure, the Project area landform, soils and hydrology present relatively limited constraints to achievement of this final land use. Due to the current flat typography of the site, the final landform at closure is relatively simple to recreate. The site contains no watercourses and the proposed mining and final landform present minimal drainage and water quality impacts. Soils have been thoroughly investigated and though soils constraints do exist with respect to alkalinity, structure, sodicity and salinity, mitigation methodologies are available and are readily implementable. Specific topsoil and subsoil handling procedures have been developed to ensure preservation of the site's valuable soils resources.

The post-mining landform would be a gently undulating plain which is consistent with the existing landform. The goal is to restore final landform levels and local relief similar to current conditions, avoiding sharp relief between the existing and rehabilitated landscapes.

The key design criteria for the final landform are:

- Final levels are within +/- 0.5 m of existing levels when averaged across the mining blocks
- Landform gradients will be typically less than 3% across agricultural areas and avoid sharp relief between rehabilitated landscapes and surrounding land
- Drainage will be predominantly as sheet flow mirroring present conditions; and

- Topsoil and subsoil profile restored to minimum 1m deep comprising at least 20cm of topsoil and 80 cm of clayey subsoil material.

This final landform was assessed as part of EES Technical report J: Geotechnical impact assessment (Pitt&sherry, 2023a). The assessment identified that this final landform is readily achievable. The proposed final landform would be safe and stable. It would present a very low relief environment with no steep gradients or unstable slopes, no watercourses and no complex landforms to reinstate. The very low site gradients and low erosion hazard of the region indicates a very low risk of instability of the final reconstructed landscape. The final landform would support a range of potential agricultural uses consistent with the agricultural activities that occur throughout the region.

10.1. Rehabilitation methodology

As part of the rehabilitation methodology, four rehabilitation domains were identified based on rehabilitation requirements: 1) processing and infrastructure areas; 2) active mining areas; 3) stockpiles; and 4) services and transport corridors. Each has different rehabilitation requirements based on the nature of mining activities and disturbance, with a final land use for agricultural purposes except for those areas that would be reinstated as public roads.

The domain related to the decommissioning and rehabilitation of sewage treatment and power generation activities would be Domain 1. Each rehabilitation domain presented in Table 19 below.

Table 19 Rehabilitation domains

Domain	Coverage	Key rehabilitation activities
1	Processing and Infrastructure Areas: • Process plant • Run of mine stockpile • Workshop/admin buildings/laboratory • Water treatment plant • Haul roads • Hardstands • Water storage dams	• Decommissioning and removal of infrastructure and utilities • Waste removal, contamination assessment and remediation • Backfill excavation (e.g. dams) and rip hardstands • Removal of temporary environmental and drainage controls • Soil replacement and revegetation • Reinstatement of public roads and other infrastructure (e.g. fences) • Retention of infrastructure (e.g. roads, dams, hardstands, water supply infrastructure, electrical / telecommunication services) where agreed for the final land use
2	Active mining areas: • All mine cells which also service as tailing storage/disposal	• Removal of infrastructure and services • Controlled backfill with overburden, subsoil and topsoil following tailings dewatering • Soil preparation and revegetation • Reinstatement of public roads and other infrastructure (e.g. fences) • Removal of temporary environmental and drainage controls
3	Stockpiles: • Overburden • Subsoil • Topsoil	• Stockpile removal • Soil replacement and revegetation • Reinstatement of public roads and other infrastructure (e.g. fences) • Removal of temporary environmental and drainage controls
4	Services and Transport Corridors:	• Rehabilitation of areas disturbed during installation of water supply pipeline (construction stage)

Domain	Coverage	Key rehabilitation activities
	• External water supply pipeline from Kangaroo Lake • Public roads	• Removal of underground water supply pipeline except where agreed to be retained (decommissioning stage) • Soil preparation and revegetation as appropriate • Reinstatement of public roads and other infrastructure (e.g. fences) subject to any required further design and local authority approval • Reinstate roadside native vegetation in accordance with relevant Ecological Vegetation Class (EVC) • Replace boundary fencing

Decommissioning the Project would include activities associated with removing mining infrastructure and the removal and/or remediation of contaminants and hazardous materials if required. It is assumed that all fixed plant, buildings, mine roads and water storage infrastructure would be completely decommissioned and removed prior to, or during the mine closure process. If desired certain infrastructure such as water supply lines and electrical infrastructure may be retained to assist the future land use, where agreed with future land owners.

A Decommissioning and Closure Management Plan would be prior to end of mining to guide activities at the end of the mine operations and detail the resources needed to undertake those activities. Generally, the Decommissioning and Closure Management Plan would address the following:

- Before demolition, all infrastructure to be evaluated in terms of the presence of hazardous substances and land contamination, and appropriate management strategies developed to protect employees and the public to minimise potential environmental harm. This includes the identification of the various waste streams and development of management strategies in accordance with the appropriate waste legislation.
- Decommissioning risk assessment.
- Inventory of all salvageable equipment and resources.
- Waste management strategy identifying waste types, indicative quantities, disposal and recycling practices for all materials, and suitable disposal locations.
- Decommissioning and demolition plans.
- Telecommunications, water supply and other services to be disconnected and removed unless agreed to remain. Services removal to adopt techniques that minimise additional land disturbance and ensure prompt stabilisation and restoration of final landforms to support the desired land use.
- A plan for reconstruction of local roads closed by mining. This would address matters such as collecting and storing materials useful in future rehabilitation (e.g. pavement material, roadside habitat such as logs, stumps and vegetation, collection of local seeds and raising of tubestock for native vegetation replanting), and replacement of fencing. Detailed design of roadways and approvals required from local roads authority.
- Where services are buried (e.g. pipelines, cables) and their retrieval may lead to further unacceptable disturbance, the infrastructure may be left in situ if agreed with the relevant authority (subject to any necessary approvals or agreements) if they don't pose constraints to the final land use. In this situation, the location of the services would be surveyed and marked on the site plan and a suitable caveat developed to provide that they are readily identifiable for future land holders.
- Fuel and other hazardous materials stores to be decommissioned and removed, and contamination assessments undertaken to identify remediation requirements for any contaminated soil or water resources.
- All buildings, fixed plant and other infrastructure that are not required as part of the final land use would be demolished and removed. Demolition would be carried out in accordance with the AS 2601—2001, *The demolition of structures*.

10.2. Rehabilitation objectives and completion criteria

The whole of site objective for rehabilitation is: “to restore land disturbed by mining to an equivalent (or better) agricultural land capability to enable a variety of productive agricultural uses.”

This overall objective is supported by a set of rehabilitation objectives. The specific rehabilitation objectives which support sewage treatment and power generation are associated with the processing and infrastructure mining domain. These specific objectives are presented in Table 20.

Table 20 Rehabilitation objectives and completion criteria – Processing and infrastructure

Mining domain	Rehabilitation objective	Completion criteria
Processing / infrastructure	Infrastructure decommissioning: All infrastructure that is not to be used as part of the final land use will be decommissioned and removed to ensure the site is safe, stable and free of hazardous materials. Infrastructure to be removed within two years of operations completion.	All infrastructure and underground services removed in accordance with a Decommissioning and Closure Plan, including: • Fuel and chemical tanks and drums are removed in accordance with relevant guidelines. • Mining roads are removed and revegetated. • Water pumps and pipelines are removed (unless post mining users are identified, and the assets repurposed and relicensed for agricultural or other uses). • Ground water piezometers and any temporary supply bores are sealed, except as required for long term monitoring post closure • Hazardous and contaminated materials are removed • Offices/ laboratory, stores and workshops are dismantled, demolished and removed; • Processing plant and MUPs are dismantled and materials salvaged and recycled where possible, but otherwise removed; and • Waste tracking documentation verifies legal disposal of all wastes.
	Water storage removal: Water storages that are not retained as part of the final land use, are to be drained and backfilled.	• Water quality in storages is tested prior to dewatering. • Dewatering avoids release of contaminants to land or waters. • Sediments accumulated in sediment dams are tested, removed and emplaced in the final landform if suitable. • Contaminated sediments deemed unsuitable for emplacement in the voids are disposed offsite at a facility licensed to accept contaminated waste, or emplaced onsite subject to further assessment. • Contaminated sediments would be analysed and sampled in accordance with IWRG702 and classified in

Mining domain	Rehabilitation objective	Completion criteria
		accordance with EPA Publication 1828.2 and the EP Regulations to determine a lawful place for off-site disposal. • All ancillary equipment including pumps and pipelines are removed and services terminated. • Dams are backfilled in a controlled way consistent with geotechnical advice to minimise post closure settling. • Water storages are removed and land regraded so final land surface is contiguous with surrounding landscape in preparation for return to agricultural practices.
	Water storage retained: Water storages to be retained as part of the final landform will be for a clear and agreed purpose, and be safe, stable and sustainable.	• Sediments tested and any contaminated materials removed from water storages ensuring no residual contaminants exist that would compromise future water use goals. • Retained dams will be assessed and verified as structurally sound by a suitably qualified person. • Water quality is tested and fit for the final use (e.g. agriculture, stock and domestic) consistent with relevant water quality guidelines. • Dams are licenced (if required) in accordance with relevant state legislation.
	Retained infrastructure: Infrastructure is only to be retained where it is sympathetic to and supports the final land use, has a clear purpose and is in a condition that does not present undue risk to safety or the environment.	• Any retained infrastructure is to have a clear purpose and agreement from relevant stakeholders that the purpose is supported and the retained infrastructure is safe, stable and sustainable. • Condition assessments and certification are completed as required. • Hardstands and tracks retained in a fit for purpose condition that is safe and stable and supports the final land use.
	Land free of contamination: Land, water and soils are free from contamination, safe, compatible with the final land use and pose no unacceptable threat of ongoing environmental harm or risk to people.	• Hazardous materials are removed from site and any wastes and visible indicators of contamination are cleaned up. • Soils (and where required water) tested and site validated as fit for final land use in accordance with applicable guidelines including the National Environment Protection (Assessment of Site Contamination) Measure (1999).

Mining domain	Rehabilitation objective	Completion criteria
		• Water quality monitored with respect to the relevant Environment Reference Standard and fit for final land use. • Water quality and quantity are not impacted at any sensitive receptors/beneficial uses/environmental values.

Further information is provided in in EES Technical Report P: Rehabilitation and Closure (Pitt&sherry, 2023b).

11. Environmental management during operation

11.1. Environmental management system

VHM adopted an Environmental Management System (EMS) that is aligned with AS/NZS ISO 14001:2015 (Environmental Management Systems – requirements with guidance for use) (ISO 14001) and sets out a framework to conduct all activities with the goal of achieving best practice environmental and health and safety performance, to ensure there is no harm to people and that any potential environmental impacts are managed to be as low as reasonably practicable. The EMS would be based on the principle of continual improvement and the 'plan, do, check, act' cycle in line with ISO14001.

In addition, the following management plans will be adopted, among others, to prevent or minimise risks to the environment.

- Work plan: has been drafted to meet the required information as set out section 40(3) of Mineral Resources (Sustainable Development) Act 1990 (MRSDA) and regulation 42, regulation 43(2), regulation 44 and regulation 45 and regulation 46 Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2019 (MRSD(MI)R. The Work Plan would require approval for assessment by the Earth Resources Regulation (ERR) branch of Department of Energy, Environment and Climate Action (DEECA). The Work Plan would be implemented during the construction, operation, decommission and rehabilitation phases for Activities within the mining licence area. In addition to this work plan, the following documents are provided in the work plan document package to meet the obligations of the information that must be provided for a mining operation under the MRSD Act 1990 and the associates MRSD(MI)R 2019.
    - Risk Management Plan – Would be prepared to provide a document that meets the requirements of section 40(3)(b) Mineral Resources (Sustainable Development) Act 1990 and Regulation 44 and 45 of Mineral Resources (Mineral Industries) Regulations 2019 and to provide environmental mitigation and monitoring to meet the obligations under the Environment Protection Act 2017. The plan itself includes risk treatment plans for key areas of activity.
    - Rehabilitation Plan - A detailed Rehabilitation Plan supports the Work Plan and has been prepared in accordance with the items prescribed under the MRSD Act 1990 and regulation 43 of Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2019.
    - Community Engagement Plan (CEP) - The CEP would ensure that relevant stakeholders have been consulted regarding the mining program, and potential issues raised by stakeholders are identified at an early stage.
- Incorporated document - Has been prepared to facilitate the delivery of infrastructure required to support the Project on land outside the area subject to mining licence. The Incorporated document would address requirements under the Planning and Environment Act 1987 (Planning and Environment Act), for the specific controls overlay area only. These include:

  - Environmental Management Plan – Would be prepared in consultation with Gannawarra Shire Council and Swan Hill Rural City Council, to the satisfaction of the Minister for Planning. The EMP would:
    - Address commitments in the EES and conditions of approval for the project including risks, mitigation and roles and responsibilities.
    - Outline the process and timing for the preparation of Construction Environment Management Plans (CEMP) and other plans required by mitigation measures that apply to infrastructure works required to support the Project on land outside the area subject to mining licence.
    - Outline performance monitoring and reporting processes, including auditing to ensure environmental and amenity effects are managed in accordance with mitigation measures during construction and operation of infrastructure works required to support the Project on land outside the area subject to mining licence.
    - Outline responsibility for, and frequency of, reviews of the EMP.

- Construction Environmental Management Plan (CEMP): Would be prepared in accordance with EPA Victoria Publication 1834 – Civil construction, building and demolition guide and in in consultation with Gannawarra Shire Council and Swan Hill Rural City Council, to the satisfaction of the Minister for Planning. The CEMP would apply to the construction works situated outside of the mining licence boundary and include the following::
  - Staging plan.
  - Location of works office and machinery storage.
  - Hours of construction.
  - Access routes for construction vehicles.
  - Vehicle and machinery exclusion zones.
  - Management measures for surface water.
  - Measures to protect areas of conservation or heritage and/or Aboriginal cultural heritage significance.
  - Measures to protect existing vegetation and human health, and manage weeds, dust and construction noise and vibration.
  - Location of machinery and vehicle wash down area.
  - Management of litter, construction waste and chemical storage.
  - Details of construction personnel parking.
  - Contact details for on-site personnel and supervisors.
  - Details of removal of works, building and staging areas on completion of construction.
  - Methods for informing and training contractors on requirements of the plan.
  - Site inductions, training, competency, and awareness.
  - Emergency preparedness and response.

Additional plans, and amendments to plans, are expected to be developed throughout the Project in response to the conditions of approval, monitoring results, and review and updates to the environmental risk assessment. These management plans would also be updated on a regular basis including when alterations are made due to changes in operations.

Further information is provided in Chapter 21: Environmental management framework (AECOM, 2023b).

11.2. Environmental monitoring

VHM will undertake a monitoring program as discussed in the Table 21 below. Further information is provided in Chapter 21: Environmental management framework (AECOM, 2023b).

Table 21 Summary of proposed monitoring programs

Environmental aspect	Monitoring program / measure	Project phase
Noise	A Noise Management Plan (NMP) will be developed, which formally documents all of the monitoring, managerial and engineering measures to be implemented to control noise within and from the site. The NMP will be based on an updated and validated noise model based on the results of the proposed noise monitoring surveys and commissioning measurements. The Noise Management Plan will provide a framework for updating the noise model during Project operation to assess noise emissions from the Project, the effectiveness of mitigation measures and the need for further controls, where required. The Noise Management Plan will ensure that the risk of harm from noise is minimised so far as reasonably practicable throughout all stages of the Project, including the detailing of inspection, maintenance and continual improvement of equipment, plant and their noise mitigation measures to prevent increased noise emissions due to defective operation, ageing, or other preventable deterioration. In developing the NMP consideration shall be given to frequency spectrum as a prescribed factor and specifically the potential risk of problematic low frequency noise. Commissioning noise surveys will be completed for all major fixed plant components e.g. power station, processing plant, pumping station etc. to ensure they achieve their respective noise emission requirements. If any non-conformance or unanticipated additional noise sources are identified, they will be evaluated and options for amelioration considered. As the mine cells and operations will change through the duration of the Project a program of annual noise monitoring surveys will be developed and implemented. Monitoring will be completed at the nearest affected receptors as well as an appropriately located reference location. Annual noise monitoring data will inform the periodic update of the noise model to allow for continuous improvement. Monitors will be used that hold NATA accredited calibration and are compliant with the relevant Australian Standards and EPA guidelines (e.g. publications 1996 and 1997). Monitoring will be conducted by a suitably qualified person in accordance with EPA guidelines (e.g. publications 1996 and 1997).	Construction Operation Closure

Environmental aspect	Monitoring program / measure	Project phase
Air quality	A Project specific air quality monitoring plan will be developed to: • Set out monitoring responsibilities of staff and contractors • Identify air quality indicators to be monitored • Establish monitoring criteria for the air quality indicators • Set out appropriate air quality monitoring methods, schedules and reporting requirements.	Construction Operation Closure
Groundwater	Purpose: Minimise risk of harm to groundwater during construction, operation and following mine closure and rehabilitation. Prior to construction, groundwater monitoring would be undertaken to inform baseline conditions to develop a baseline groundwater level and quality database against which changes to groundwater can be monitored. Within six months of two years continuous operation update groundwater modelling predictions undertaken in the Groundwater Impact Assessment based on site monitoring with the aim to: • refine predictions on potential extent of groundwater quality and levels changes during and post operations. • review (and potentially update) groundwater monitoring regime. • establish the nature and extent of natural attenuation process and provide prediction on groundwater quality changes during and post operations. Indicators and objectives: Groundwater quality and levels as set out in a site-specific Groundwater Management Plan (GMP) and in accordance with the ERS. Parameters: Groundwater parameters and chemicals of concern as set out in the GMP. Locations: Groundwater monitoring locations would be specified in the GMP. Frequency: Groundwater monitoring would be conducted biannually (in accordance with EPA Publication 669.1) and in accordance with the GMP. Trigger levels and contingency actions: If water level or water quality change is detected or reveals unplanned impacts over the life of operations undertake review of groundwater data and whether change in mining practices will result in reduced impact. Review modelling results with observed data to update and inform a revaluation of impact assessment. Detailed trigger levels and contingency actions would be specified in the GMP.	Construction Operation Closure

11.3. Emergency response

During operation, security and a trained emergency response team would be present on-site. The emergency response team would cover fire, HAZMAT and other identified site emergency response functions.

A site-specific Emergency Management Plan would be developed as part of the Goschen Work Plan. The emergency management plan is to include:

- Emergency prevention, preparedness and mitigation activities.
- Activities for preparing for, and prevention of emergencies (e.g. training and maintenance).
- Control and coordination arrangements for emergency response (e.g. evacuation procedures, emergency Assembly Areas and procedures for response to hazards); and
- The agreed roles and responsibilities of on-site personnel (e.g., equipment isolation, fire brigade liaison, evacuation management).

Prior to commissioning the facility, VHM will offer a familiarisation visit and explanation of emergency service procedures to CFA and other emergency services.

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Appendix A

ASIC extract

ASIC
Australian Securities & Investments Commission

Australian Company

VHM LIMITED
ACN 601 004 102

Extracted from ASIC's database at AEST 10:45:49 on 29/09/2022

Company Summary	
Name:	VHM LIMITED
ACN:	601 004 102
ABN:	58 601 004 102
Registration Date:	31/07/2014
Next Review Date:	31/07/2023
Former Name(s):	VHM EXPLORATION LIMITED, VHM EXPLORATION P TY LTD
Status:	Registered
Type:	Australian Public Company, Limited By Shares
Locality of Registered Office:	SUBIACO WA 6008
Regulator:	Australian Securities & Investments Commission

Further information relating to this organisation may be purchased from ASIC.

Appendix B

Health Environment Management Plan

Prepared for
VHM Limited
ABN: 58 601 004 102

Health and Environment Management Plan

Goschen Mineral Sands and Rare Earths Project

31-May-2023
Goschen Mineral Sands and Rare Earths Project

Health and Environment Management Plan

Goschen Mineral Sands and Rare Earths Project

Client: VHM Limited

ABN: 58 601 004 102

Prepared by

AECOM Australia Pty Ltd
Wurundjeri and Bunurong Country, Tower 2, Level 10, 727 Collins Street, Melbourne VIC 3008, Australia
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ABN 20 093 846 925

31-May-2023

Job No.: 60671345

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 and ISO45001.

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Acronym List

Term	Description
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ASC	Australian soil classification
AS/NZS	Australian and New Zealand standards
BoM	Bureau of Meteorology
CEC	Cation exchange capacity
CMA	Catchment Management Authority
CEP	Community Engagement Plan
CVO	Chief Veterinary Officer
DEECA	Department of Energy, Environment and Climate Action
DIWA	Directory of Important Wetlands in Australia
EES	Environment Effects Statement
EPA	Environment Protection Authority Victoria
ERS	Environment Reference Standard
FBT	Flow balance tank
FPP	Feed preparation plant
GDE	Groundwater dependent ecosystems
GED	General Environmental Duty
HAL	Hot acid leach
HEMP	Health Environment Management Plan
HiTi	High titanium
HMC	Heavy mineral concentrate
HMP	Hydrometallurgical plant
LCA	Land capability assessment
LOR	Limit of reporting
m bgl	Metres below ground level
MCC	Motor control centre
ML	Megalitres
MSP	Mineral separation plant
Mtpa	Million tonnes per annum
MUP	Mining unit plant
OEM	Original equipment manufacturer
PLC	Programmable logic controller
PWP	Process water pond
RCP	Representative Concentration Pathway

Term	Description
REMC	Rare earth mineral concentrate
RMP	Risk Management Plan
ROM	Run of mine
SBR	Sequencing batch reactor
SMU	Soil map unit
TDS	Total dissolved solids
VHM	VHM Limited
WCP	Wet concentrator plant
WMIS	Water Measurement Information System

1. Introduction

1.1. Project overview

The Goschen Mineral Sands and Rare Earths Project (the Project) would involve the mining and processing of heavy mineral sands and rare earths in the Loddon Mallee Region of Victoria, approximately 35 km south of Swan Hill (refer to Figure 1). Mining would occur at a throughput of approximately 5 million tonnes per annum (Mtpa) to produce mixed heavy mineral concentrate (HMC), zircon concentrate, rutile product, leucoxene products, ilmenite product and rare earth mineral products, over an approximate 20 to 25 year mine life. Mine products are proposed to be transported via road and rail for export overseas.

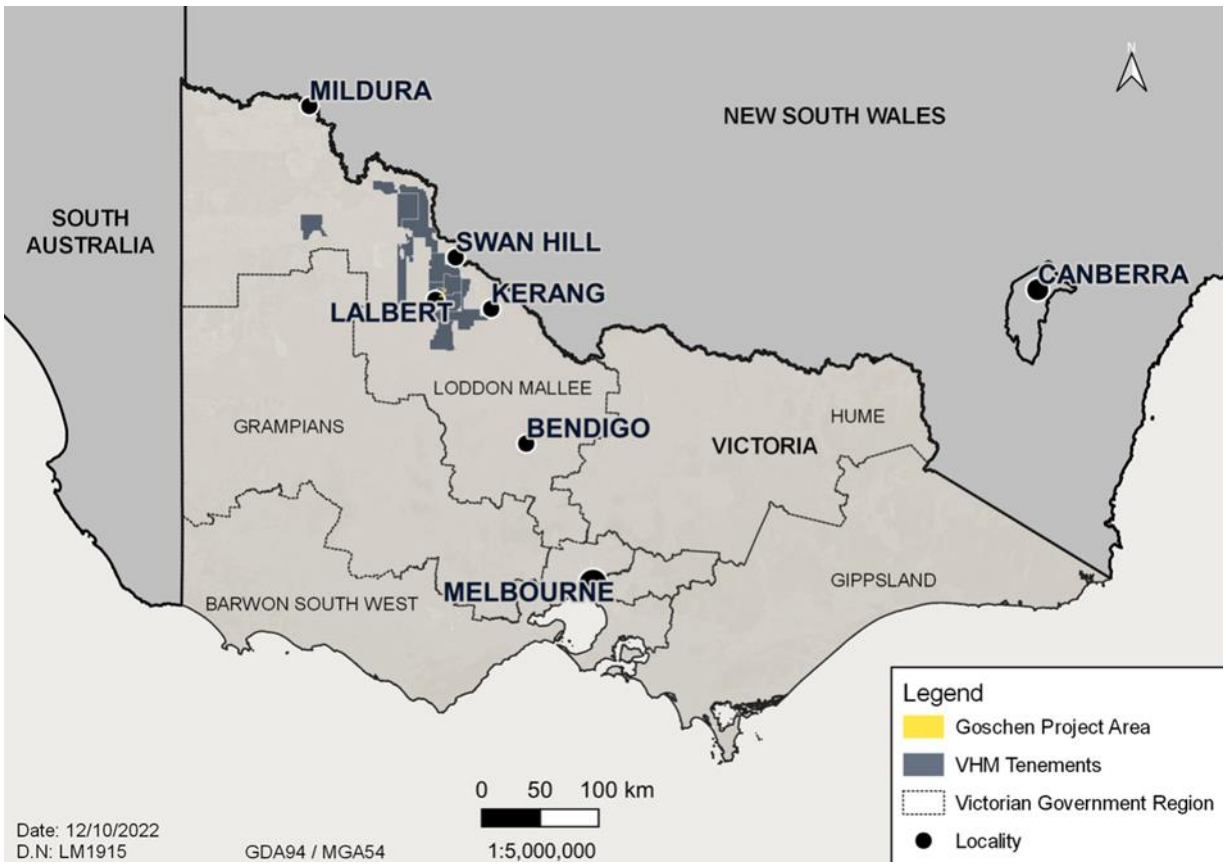


Figure 1 Regional setting

VHM Limited (VHM) would implement the mine development in phases. Phase 1 would involve a mining unit plant (MUP), wet concentrator plant (WCP), feed preparation plant (FPP) and a rare earth mineral concentrate (REMC) flotation plant. The product suite for Phase 1 consists of zircon. titania heavy mineral concentrate (HMC) and REMC products. Phase 1A would add a hydrometallurgical plant (HMP) downstream of the REMC flotation plant. The HMP would commence operations approximately 18 months post first production. The product suite for Phase 1A consists of mixed rare earth carbonate (MREC) products and zircon/ titania HMC.

Phase 2 would commence approximately 24 months post first production and, subject to prevailing market circumstances, consist of an additional mineral separation plant (MSP), hot acid leach (HAL) and chrome removal circuit. The additional plant would allow for the production of premium zircon, zircon concentrate, high titanium (HiTi) rutile, HiTi leucoxene and low chromium ilmenite.

To support the Project, a development licence has been prepared for the treatment, discharge or depositing of sewage (including sullage), exceeding a design or actual flow rate of 5,000 litres per day. An on-site sewage treatment plant would be needed to support approximately 100 workers per 12 hour shift during operations. Treated effluent from the sewage treatment plant would be recycled on-site and

mixed with raw processing water sourced from Kangaroo Lake for use as part of mineral processing. As such, the sewage treatment plant would have a maximum capacity of up to 20,000 litres per day and would require a development licence under the *Environment Protection Act 2017* (EP Act).

1.2. Purpose

Given that treated effluent would be reused as part of mineral processing during operation of the Project, approval of the reuse scheme is required from the Environment Protection Authority (EPA) as part of either an A03 (sewage treatment) operating licence or A14 (reclaimed wastewater supply or use) permit.

This Health and Environment Management Plan (HEMP) has been prepared to support the approval of the proposed reuse scheme and to support the ongoing management of the proposed reuse scheme during operation of the Project. This HEMP would be finalised as part of either the A03 operating licence or A14 permit application. As detailed design of the Project progresses, it is expected that this HEMP would be updated.

The purpose of this HEMP is to identify the risks to human health and the environment associated with the reuse scheme and outline the preventative measures that would be implemented to manage the ongoing risks associated with reusing treated effluent.

EPA Publication 1910: *Victorian guideline for water recycling* and EPA Publication 1911*: Technical information for the Victorian guideline for water cycling* identifies the information required in a HEMP as follows:

- Roles and responsibilities (Section 3)
- Health management plan (Section 6)
    - Human health risk assessment (Section 5)
    - Managing the supply system (Section 8).
    - Distribution and reticulation (Section 8).
    - Plumbing (Section 8).
    - Audit and review requirements (Section 11).
- Environmental management plan (Section 7)
    - Land capability assessment (Section 4).
    - Environmental risk assessment (Section 5).
    - Preventative measures identified for management (Section 7).
    - Risk based monitoring (Section 7).
    - Audit and review requirements (Section 11).

In accordance with EPA Publication 1911, given that a Class A recycled water scheme is not being proposed, a recycled water quality management plan (RWQMP) has not been prepared as part of this HEMP and considering the low risk and single use of the scheme, a user site management plan has not been incorporated with this HEMP.

1.3. Interaction with other documents

An Environment Effects Statement (EES) has been prepared for the Project under the *Environment Effects Act 1978*. As such, the following EES documents have informed this HEMP:

- Chapter 3: Project description
- Chapter 21: Environmental management framework
- Chapter 22: Community & stakeholder engagement
- Technical Report I: Groundwater impact assessment

- EPA Development Licence Application APPXXXXXX
- Work Plan – Goschen Rare Earths and Mineral Sands Project

The Project requires a Work Plan which considers the requirements set out in Section 40(3) of *Mineral Resources (Sustainable Development) Act 1990* and regulation 42, regulation 43(2), regulation 44 and regulation 45 and regulation 46 Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2019.

To meet these requirements, the Work Plan would comprise of the following information/ documents:

- Description of the proposed work as per Regulation 42
- Identification of hazards and risks including details of mining hazards from the set- up or construction of the work, operations and production and hazards arising from rehabilitation activities as per Regulation 44
- Preparation of a Risk Management Plan (RMP) as per Regulation 45 which sets out the control measures to be applied to eliminate or minimise the risks as far as reasonably practicable, the performance standards, systems to be applied to monitor and manage the risks and the roles and responsibilities for the risk management plan
- Preparation of a Rehabilitation Plan as per Regulation 43 which requires details for the final end use to be safe, stable and sustainable, objectives for rehabilitation domains and criteria for measurements, schedule of rehabilitation and assessment of the risk that the rehabilitated land may pose
- Preparation of a Community Engagement Plan (CEP) as per Regulation 46 which sets out how the mining licence holder will identify community attitudes, share information, receive and analyse feedback and register, document and respond to community complaints.

Sewage treatment and the reuse scheme would occur within the mining licence boundary and would therefore be managed under the Work Plan. A preliminary Work Plan has been drafted, however the Work Plan will be finalised and submitted to Earth Resources Regulation post EES.

2. Process overview

The sewage treatment plant would consist of an off-the-shelf sequencing batch reactor (SBR) and would be designed for a maximum capacity of 20 KL/day. The sewage treatment plant would be located withing the processing plant area of the mine (refer to Figure 2).

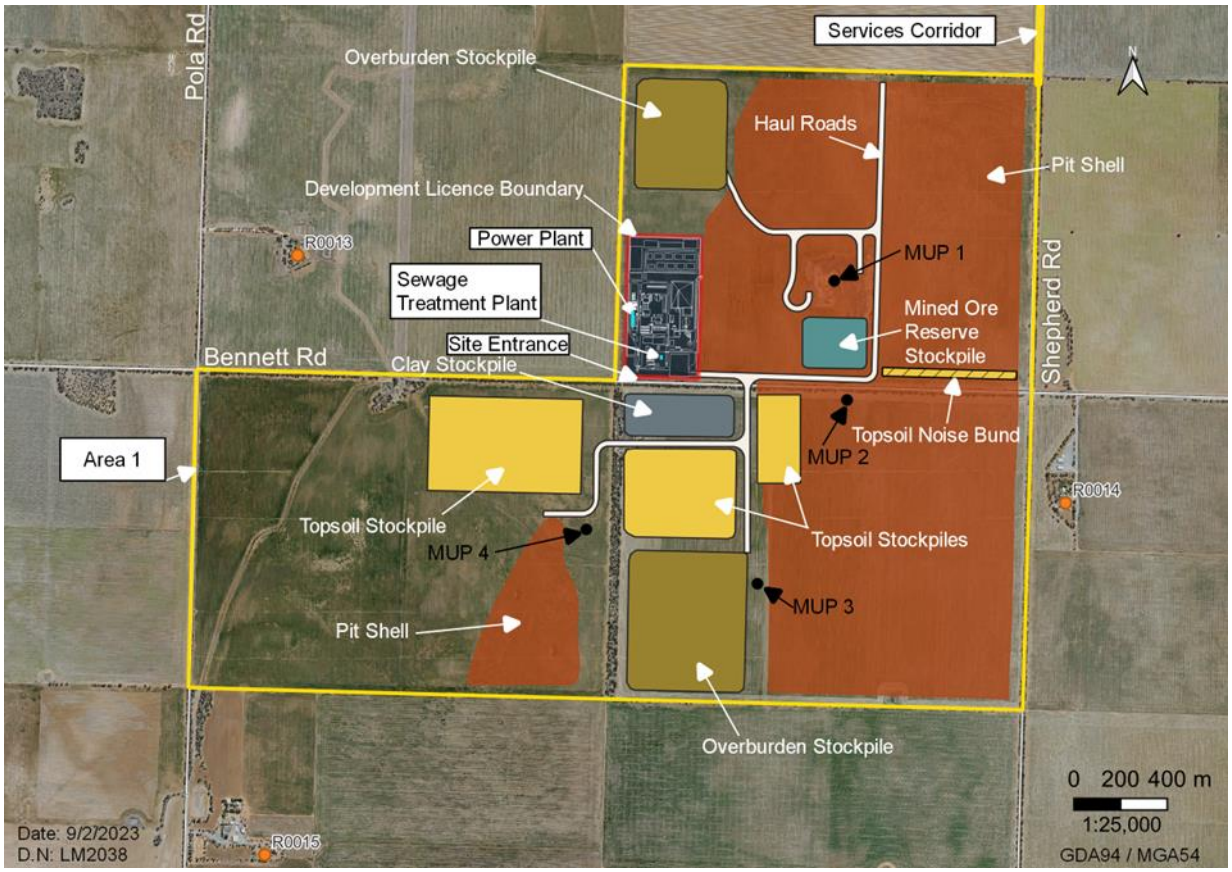


Figure 2 Mine site Area 1 layout

The sewage treatment plant would treat effluent from on-site ablutions (showers and toilets) to a standard similar to Class C recycled water.

Following treatment, effluent would discharge to a lined 60 ML process water pond (PWP). Treated effluent would be recycled and mixed with raw process water sourced from Kangaroo Lake to be used as part of mineral processing. During operations, the water requirement to operate the Project would be 3.1 GL/year (~8,500 KL/day). As such, treated effluent from the sewage treatment plant would make up less than 0.5% of the water used within mineral processing.

There would be no direct discharge of treated effluent, with the mixed process water ultimately forming part of the tailings that would be deposited on-site within mining pits. As described in the development licence, an A18 permission would be prepared for the disposal of tailings in-pit during mining operations.

The preliminary design of the sewage treatment plant would consist of four to five above ground tanks, with the largest estimated to be 46 cubic metres (m^3) in capacity (refer to Figure 3).

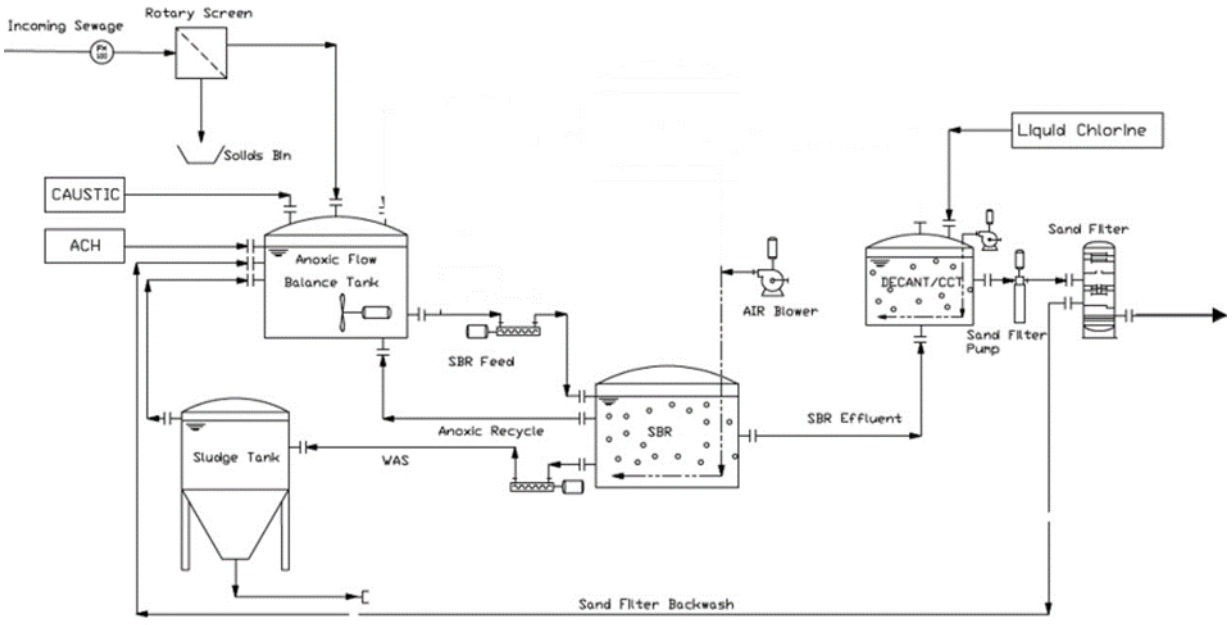


Figure 3 Preliminary sewage treatment flow diagram

The system may be described in its five key functions:

- Collection and Screening of Sewage: Waste from on-site ablutions gravitates to inground pumping stations (IPS) which are fitted with submersible sewage grinder pumps. Sewage from the pump stations is pumped into the aerated Flow Balance Tank (FBT) in which it's pH will be corrected and kept aerobic.
- Treatment of Sewage - Mixed and blended sewage will be pumped to the 46 m^3 SBR. Reagents will be automatically dosed into the incoming mainstream to the SBR to remove phosphorous from the wastewater. The SBR will operate on a mix/aerate/settle/decant cycle, with the pump feeding only during the mix/aeration period in the SBR. The SBR will be aerated by a blower and aeration lances. The contents will then be settled and treated effluent will be decanted to the treated effluent tank. Excess biosolids from the SBR will be pumped out to a 10 m^3 sludge holding tank for thickening and ultimately be disposed of off-site by a suitably licenced contractor. Supernatant from the thickening tank will return to the balance tank.
- Post-Treatment of wastewater - Treated effluent from the SBR will be chlorinated while decanting into a 10 m^3 treated effluent tank, which will also act as a chlorine contact chamber. Treated effluent in the storage tank will be mixed using a small side stream blower and after the 30-minute contact time the treated effluent will be pumped through a sand filter and across to the tailings circuit.
- Monitoring and Operations - The entire system will be fully automated and controlled via a programmable logic controller (PLC). The controls will be housed in a stainless steel MCC. The treatment plant also has the capability to be remotely monitored by Aerofloat staff in Sydney. On-site operator(s) will be trained in the monitoring/control of the system. Original equipment manufacturer (OEM) supplier will be sought to undertake regular scheduled maintenance activities.

The water quality treatment objectives for the reuse scheme are presented in Table 1 below.

Table 1 Water quality objectives (EPA Publication 1910, March 2021)

Class	Water quality objectives	Use
C	• <1,000 E. coli org/100 mL • pH 6 – 9 • <20 / 30 mg/L BOD /SS	Industrial: Systems with no potential worker exposure

A summary of the treatment process is provided in the table below.

Table 2 Process overview

Item	Summary
Source	On-site ablutions (showers and toilets)
Treatment type	Secondary treatment via a sequencing batch reactor
Volume	Up to 20,000 L/day
Effluent class	Class C recycled water
Use	Recycled water to be mixed with raw water from Kangaroo Lake and used within a closed, industrial system as part of mineral processing. Recycled water from the sewage treatment plant would account for approximately 0.5% of the daily water used in mineral processing.
Receiving environment	The mixed process water would ultimately form part of the tailings that would be deposited on-site within the void of mined pits.

3. Roles and responsibilities

A summary of the roles and responsibilities is provided in Table 3 below.

Table 3 Roles and responsibilities

Entity	Roles and responsibilities
VHM	VHM are the reuse scheme proponent. Scheme proponents must develop a HEMP.
Mining contractor	The mining contractor would be appointed by VHM and would be responsible for mine operations, including operation of the sewage treatment plant and mineral processing plant where recycled water would be used. This contractor would be the recycled water supplier, scheme manager and user and would have the following responsibilities: • Supply recycled water in accordance with this HEMP. • Operate and maintain the sewage treatment plant and any necessary connections to achieve Class C recycled water. • Complete all necessary sampling, monitoring and testing in accordance with this HEMP, including recycled water quality testing. • Undertake employee awareness and training as required. • Ensure record keeping and reporting is undertaken as outlined in this HEMP. • Provide EPA with an annual summary detailing the quantity and quality of recycled water supplied. • Notify EPA when a reportable event occurs and provide all necessary documentation.
EPA	EPA approves the development and ongoing management of a recycled water scheme. EPA is responsible for the approval of this HEMP.
Department of Health	The Department of Health is involved in settling health standard at a national level and assessing new end uses for recycled water in conjunction with EPA.
Chief Veterinary Officer	The Chief Veterinary Officer (CVO) endorses schemes that present risk to stock health and/or human health via food consumption. **It is not considered that CVO endorsement is required as part of this reuse scheme.**

4. Land capability assessment

A land capability assessment (LCA) has been undertaken to provide the environmental setting for the reuse scheme. The LCA will provide the basis for the environmental risk assessment. Information from this Section has been informed by the Project EES and any additional information can be found in the EES.

As stated in Section 2, there would be no direct discharge of treated effluent. Treated effluent would be mixed with raw water from Kangaroo Lake and used within mineral processing. This is a closed, industrial system with no public access and the treated effluent from the sewage treatment plant would make up less than 0.5% of the water used within mineral processing. The treated effluent, mixed with process water, would ultimately form part of the tailings that would be deposited on-site within empty mining pits. The mining pits would then be back filled with overburden and topsoil as part of the mine's progressive rehabilitation.

4.1. Location

The Project would be located in the Loddon Mallee Region of Victoria, near the township of Lalbert, approximately 35 km south of Swan Hill (refer to Figure 4)

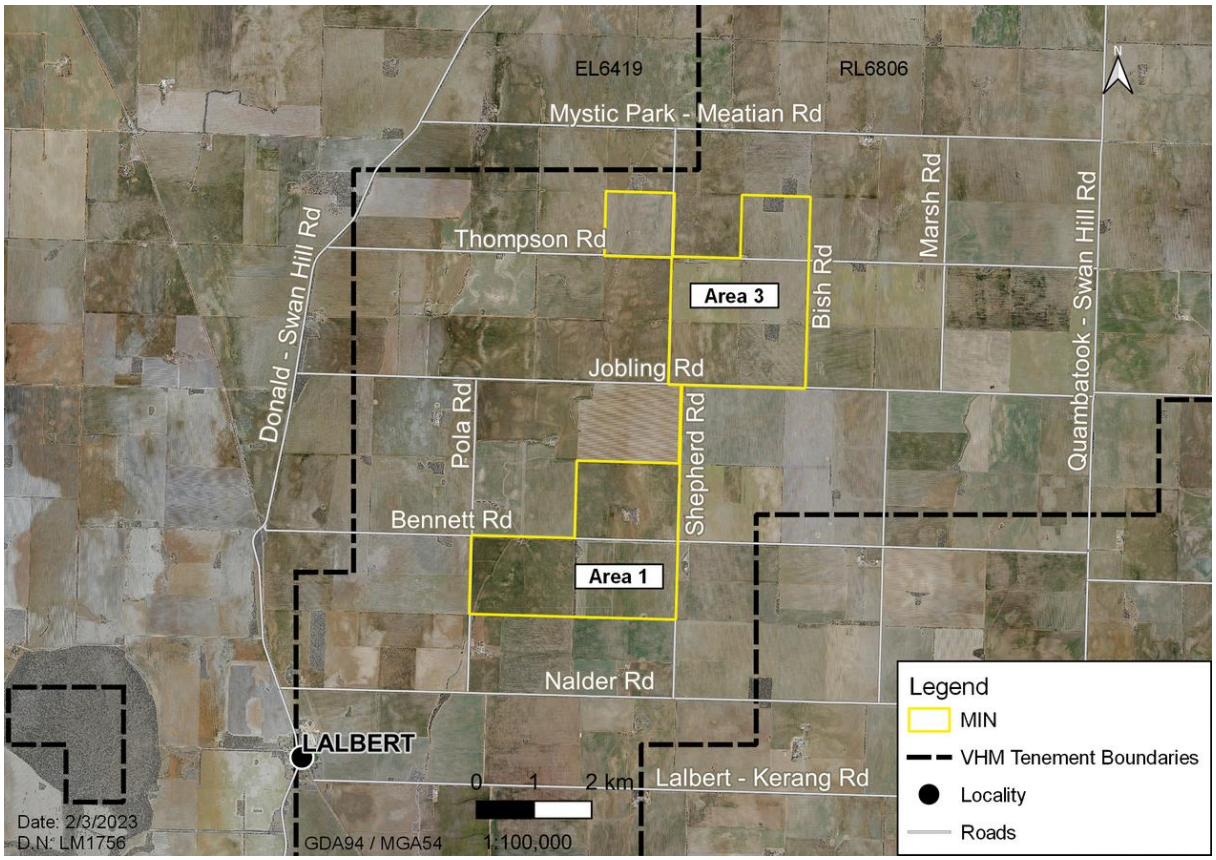


Figure 4 Project location

The Project would be separated across two distinct mining areas, mining Area 1 and mining Area 3. Mining operations would begin in Area 1 before progressing to Area 3 after eight to 10 years.

The processing plant for ore extracted from Area 1 and Area 3 would be located in Area 1, north of Bennet Road. The sewage treatment plant would be located within the processing plant area within Area 1. The proposed layout of Area 1 is presented in Figure 2 above.

4.2. Topography

The topography within the Project boundary ranges from approximately 75m to 125m AHD and is characterised by a north–south-orientated ridge (Cannie Ridge) elevated around 100–125 m AHD that can be seen transecting the proposed mine areas (refer to Figure 5).

The area surrounding the Project area is characterised by an undulating topography with depressions in the landscape. There is a peak in topography generally in Area 1 and Area 3 of the mine which distributes surface water flows to the northeast and west portions of the site down to the Lalbert Creek floodplain and towards Lake Boga.

Summary

As part of the proposed reuse scheme, no treated effluent would be discharged to surface.

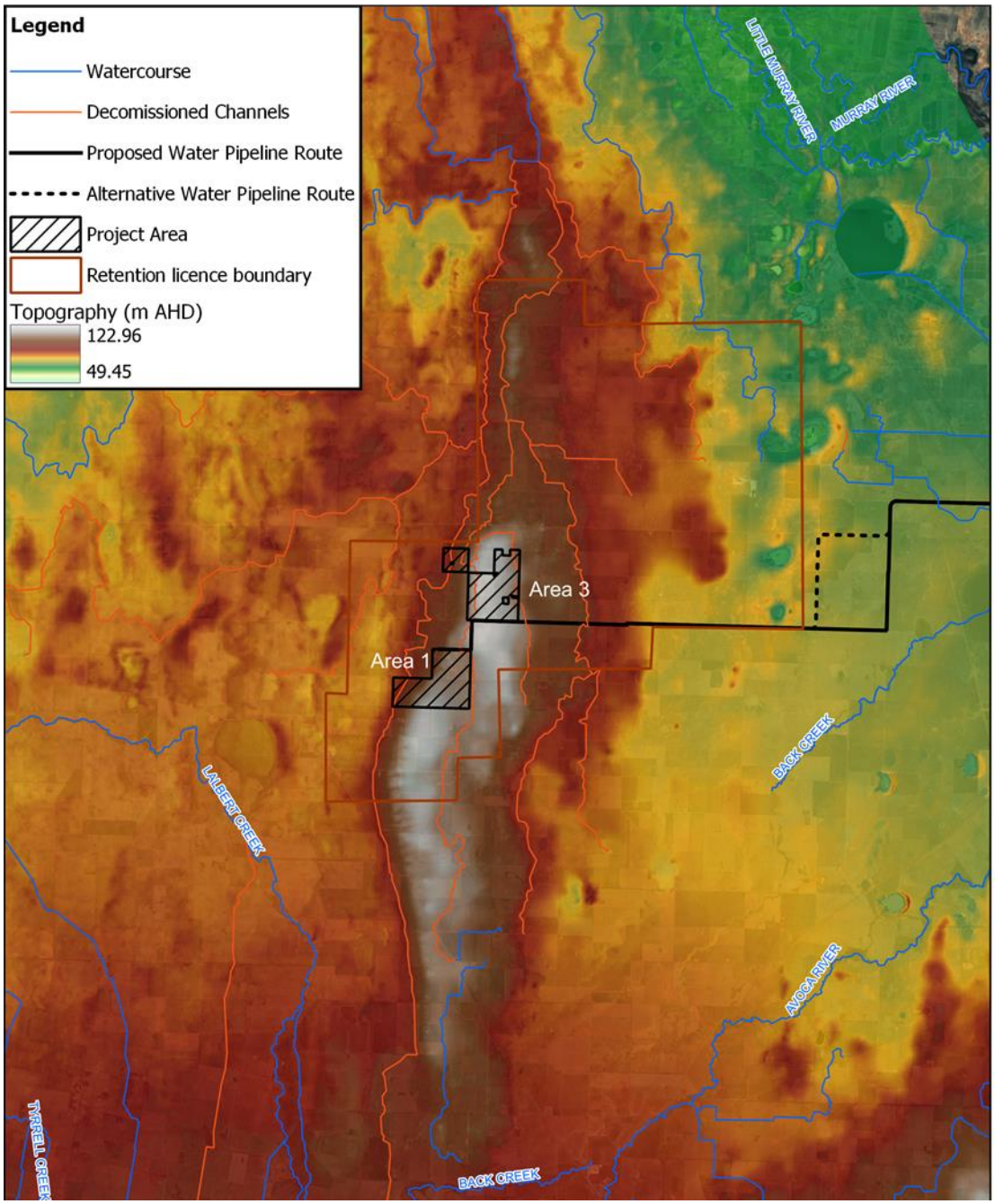


Figure 5 Local topography

4.3. Soils

One soil map unit (SMU), a calcic red-brown calcarosol, was identified within Area 1 and Area 3. This SMU consisted of the following Australian soil classification (ASC) soil types:

- Calcic red calcarosol (dominant)
- Calcic brown calcarosol (dominant)
- Eutrophic red chromosol (sub-dominant)
- Subnatric brown sodosol (sub-dominant)

Soil profiles were assessed at 14 soil sites throughout the mining areas in accordance with the Australian Soil and Land Survey Field Handbook (NCST, 2009). This involved field assessments and laboratory assessments. Laboratory assessments were undertaken at 11 of the 14 soil sites and involved sample collection and analysis from each major soil horizon, or layer. Properties assessed as part of the laboratory assessment included particle size, soil reaction (measures as pH), electrical conductivity (EC) and cation exchange capacity (CEC) and exchangeable cations. Emerson Aggregate Tests (EAT) were also undertaken in order to measure the potential for dispersion in the soils.

The observed and tested soil parameters demonstrated the similarity in soil types across the mining areas and the following conclusions were made.

4.3.1. Erosion potential

The dispersion class and erosive potential of soils within the study area was determined using the Emmerson Aggregate Test. All soil horizons within the study area were classified as having moderate to moderately high dispersion ratings and would therefore be prone to erosion. The dispersion ratings generally increased between the A horizon and B horizon at each soil site.

4.3.2. Potential for acid sulfate soils

The presence of acid sulfate soils would be extremely unlikely given the soil types present in the study area (calcarosols, chromosols and sodosols) and given the alkaline pH measurements to a depth of 1 m in the soil profile. Calcarosols and sodosols are not considered to be strongly acidic soils, as the pH is greater than 5.

4.3.3. Potential for soil acidification

Given the alkaline pH and high clay content throughout the soil profile to a depth of 1 m, the soil types in the study area would have a very low potential for acidification.

4.3.4. Potential for salinity

The majority of soil profiles are non-saline in the topsoil (A horizon) and slightly to moderately saline in the subsoil (B horizon). Given the very good drainage chrematistics of the soils, highlighted by the presence of calcium carbonate nodules and lack of mottling, the potential for an increase in salinity is low.

Summary

As part of the proposed reuse scheme, no treated effluent would be discharged to surface.

4.4. Surface water

The Project would be located within in the North Central Catchment Management Authority (CMA) management area and is close in proximity to the Mallee CMA management area. While there are no designated waterways within the Project mining areas, four primary waterways are located in the region surrounding the mine, namely the Murray River, Avoca River, Back Creek and Lalbert Creek (refer to Figure 6).

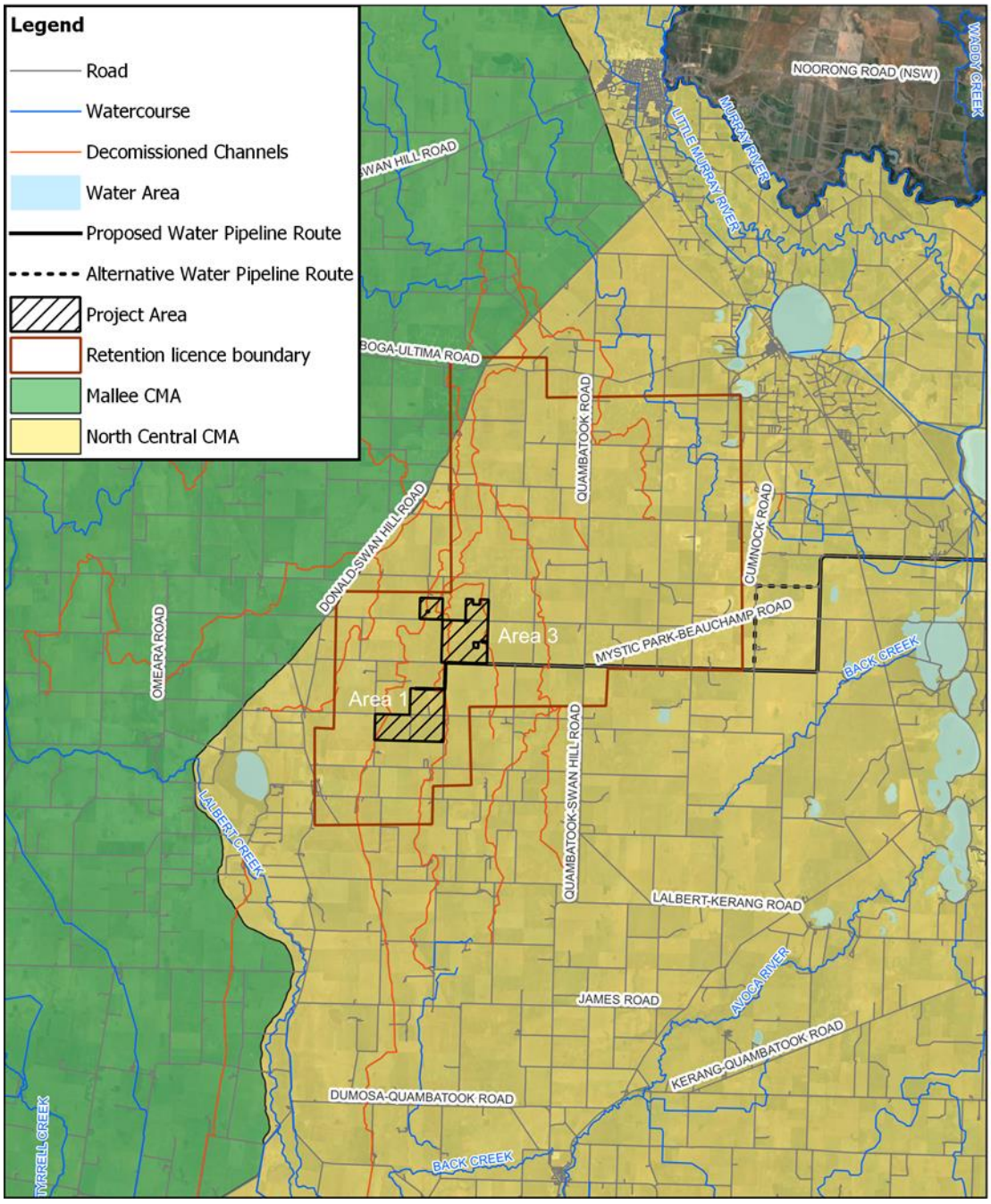


Figure 6 Surface water features

Located north of the mine, the Murray River forms part of the Murray–Darling basin river system, which drains most of the northern Victorian and southern New South Wales waterways.

The Avoca River has a history of flooding, with significant events occurring in 2010, 2011 and 2022. These events filled the Avoca Marshes and flowed through to Lake Boga. The Avoca River is an anabranching system, with the majority of floodwater leaving the river downstream of Charlton and spreading across the floodplain and through various anabranching waterways. Anabranching waterways are those which divert from the main waterbody and re-join downstream.

Part of the Avoca floodplain, Back Creek is one of its anabranching waterways. Back Creek also drains a large local catchment to the west of the Avoca River and flows back into the Avoca River system at the Avoca Marshes. Back Creek originates to the east of the Project mine site and flows in an easterly direction into the Avoca River system. Due to the low rainfall, sandy soils with high infiltration and gradually sloping land surface, the formation of natural waterways appears to be inhibited.

Lalbert Creek is an effluent stream of the Avoca River, carrying flood flows to the terminal lake systems of Lake Lalbert, west of the Project near the township of Lalbert, and Lake Timboram, north west of Ultima. Lalbert Creek also drains a large local catchment.

Within the Project mine site, surface water flows would be contained. Mine site water storage basins would be designed to capture surface water runoff from 5% Annual Exceedance Probability (AEP) events, with any runoff generated above this to be directed to the active mine pit, ensuring that that surface water runoff could not leave the site and impact downstream water quality.

Summary

As part of the proposed reuse scheme, no treated effluent would be discharged to surface.

4.5. Groundwater

4.5.1. Hydrogeology

Drilling and groundwater field assessments undertaken at the Project identified four main hydrogeological units. The Loxton Parilla Sands, Olney Formation and Warina Sand were identified as aquifers. The Geera Clay was identified as an aquitard.

Loxton-Parilla Sands

The Loxton Parilla Sands form the main aquifer in the Project area. The Loxton Parilla Sands aquifer hosts the regional aquifer and is unconfined. Unconfined aquifers are connected to the atmosphere through open pore spaces in overlaying soil and rock. The Loxton Parilla Sands consist of a coarse grained to gravelly, well sorted, quartz rich sand with interbeds of finer sand and clay and ranges in thickness from 35 to 55 metres.

Geera Clay

The Geera Clay forms a significant aquitard and consists of a dark grey to black clay of low plasticity. The unit serves as an aquitard in the region, separating the Loxton Parilla Sands from the underlying Renmark Group aquifer. Field assessments identified the Geera Clay to be prominent across the Project area. The Geera Clay aquitard ranges in thickness from 32 to 46 metres.

Renmark Group

The Olney Formation forms an aquifer underlying the Geera Clay and consists of a dark grey to black silty clay of medium to low plasticity. The unit becomes increasingly coarser grained/gravelly with depth and the thickness ranges from 13 to 25 metres.

The Warina Sand forms an aquifer underlying the Olney Formation and consist of a poorly consolidated coarse-grained sand, with clayey interbeds, minor quartz and laminated shale. The unit is encountered at depths of approximately 105 metres below ground level (m bgl).

4.5.2. Groundwater bore network

Eight groundwater monitoring bores were installed in July 2021 and were screened across the Loxton Parilla Sands aquifer, or Renmark Group, as presented in Table 4. Figure 7 shows the location of each groundwater bore.

Table 4 Groundwater monitoring bores

Bore ID	Easting	Northing	Total depth (m bgl)	Target aquifer
MW001S	718035	6052278	45	Loxton Parilla Sands
MW001D	718040	6052278	118	Renmark Group

Bore ID	Easting	Northing	Total depth (m bgl)	Target aquifer
MW002	721066	6052192	75	Loxton Parilla Sands
MW005	728795	6053398	58	Loxton Parilla Sands
MW006S	720384	6059699	49	Loxton Parilla Sands
MW006D	720384	6059691	120	Renmark Group
MW007	723888	6058434	78	Loxton Parilla Sands
MW008	722487	6060703	58	Loxton Parilla Sands

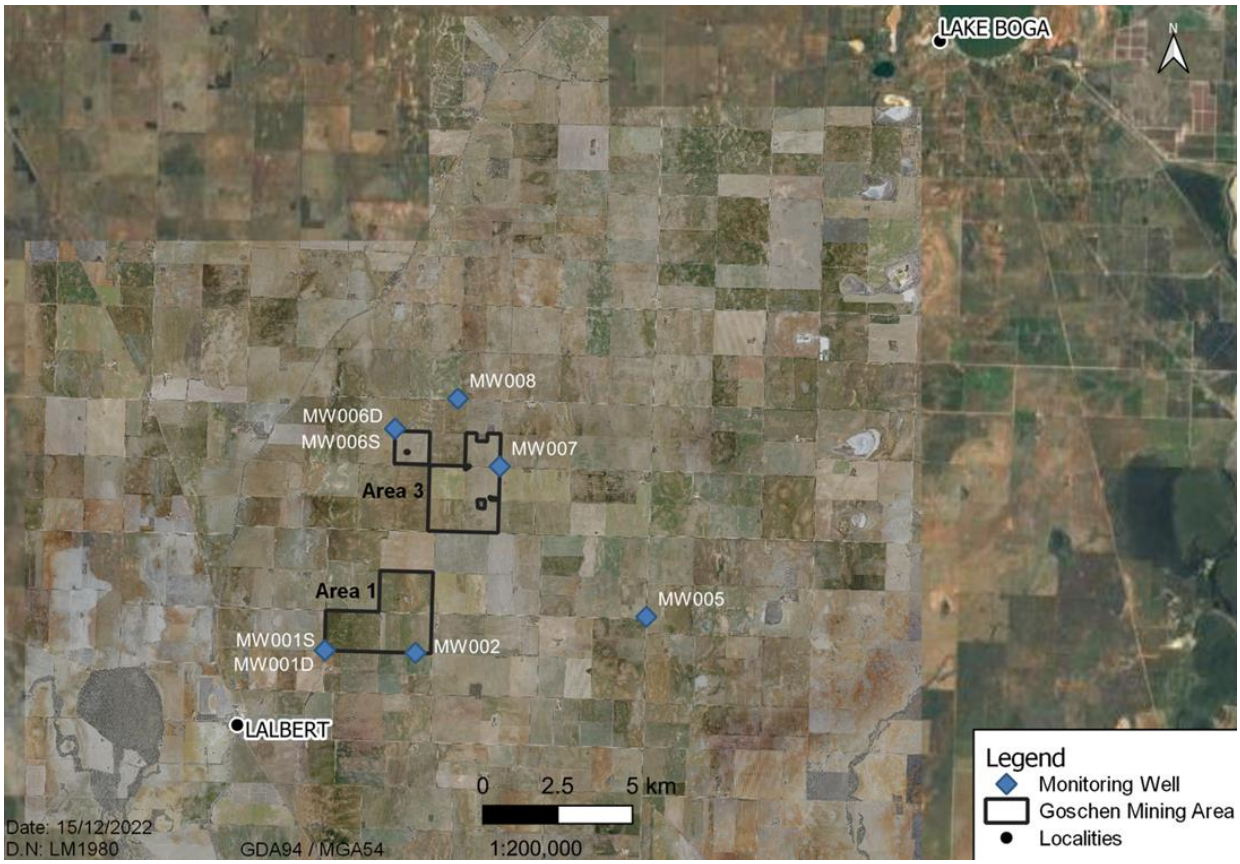


Figure 7 Project groundwater monitoring bores

A desktop search of the Department of Energy, Environment and Climate Action (DEECA) the Water Measurement Information System (WMIS) identified 18 existing groundwater bores within 10 kilometres of the Project area. The existing groundwater bores have a listed use of monitoring / observation purposes or non-groundwater / unknown. No bores were listed with the use of domestic / stock bores or licensed bores within 10 kilometres of the Project area.

4.5.3. Groundwater levels

Groundwater monitoring events conducted as part of field assessments in August 2021 and April 2022 measured the groundwater levels in each of the eight groundwater monitoring bores installed. The depth to groundwater is presented in Table 5.

Table 5 Groundwater levels

Bore ID	Measurement Date	Depth to water (m bgl)	Groundwater elevation (m AHD)	Target aquifer
MW001S	August 2021	30.5	62.5	Loxton Parilla Sands
MW001D	August 2021	29.0	63.8	Renmark Group
MW002	August 2021	47.1	64.6	Loxton Parilla Sands
MW005	August 2021	18.8	67.1	Loxton Parilla Sands
MW006S	August 2021	25.7	63.1	Loxton Parilla Sands
MW006D	August 2021	25.5	63.9	Renmark Group
MW007	August 2021	Dry	Dry	Loxton Parilla Sands
MW008	August 2021	40.4	63.2	Loxton Parilla Sands
MW001S	April 2022	29.20	62.54	Loxton Parilla Sands
MW001D	April 2022	30.45	63.82	Renmark Group
MW002	April 2022	47.04	64.64	Loxton Parilla Sands
MW005	April 2022	18.81	67.05	Loxton Parilla Sands
MW006S	April 2022	24.93	63.04	Loxton Parilla Sands
MW006D	April 2022	25.72	63.88	Renmark Group
MW007	April 2022	Dry	Dry	Loxton Parilla Sands
MW008	April 2022	39.89	63.15	Loxton Parilla Sands

In addition to the bores installed in July 2021, groundwater level data was available from eight of the 18 existing groundwater bores identified through WMIS. These levels indicated that groundwater elevations varied between approximately 59 m AHD and 67 m AHD for the Loxton Parilla Sands.

By combining groundwater elevation data from monitoring bores installed during the field assessments with existing WMIS monitoring bores, groundwater contours have been developed and the directional flow of groundwater has been inferred. The groundwater elevation contours indicate that groundwater in the Loxton Parilla Sands aquifer flows to the northwest (refer to Figure 8). The inferred groundwater elevation at the proposed mining locations is approximately 64 m AHD. Given that the average surface elevation of the Project area is approximately 112 m AHD, the inferred depth to groundwater at the proposed mining locations is approximately 48 metres below ground level (m bgl).

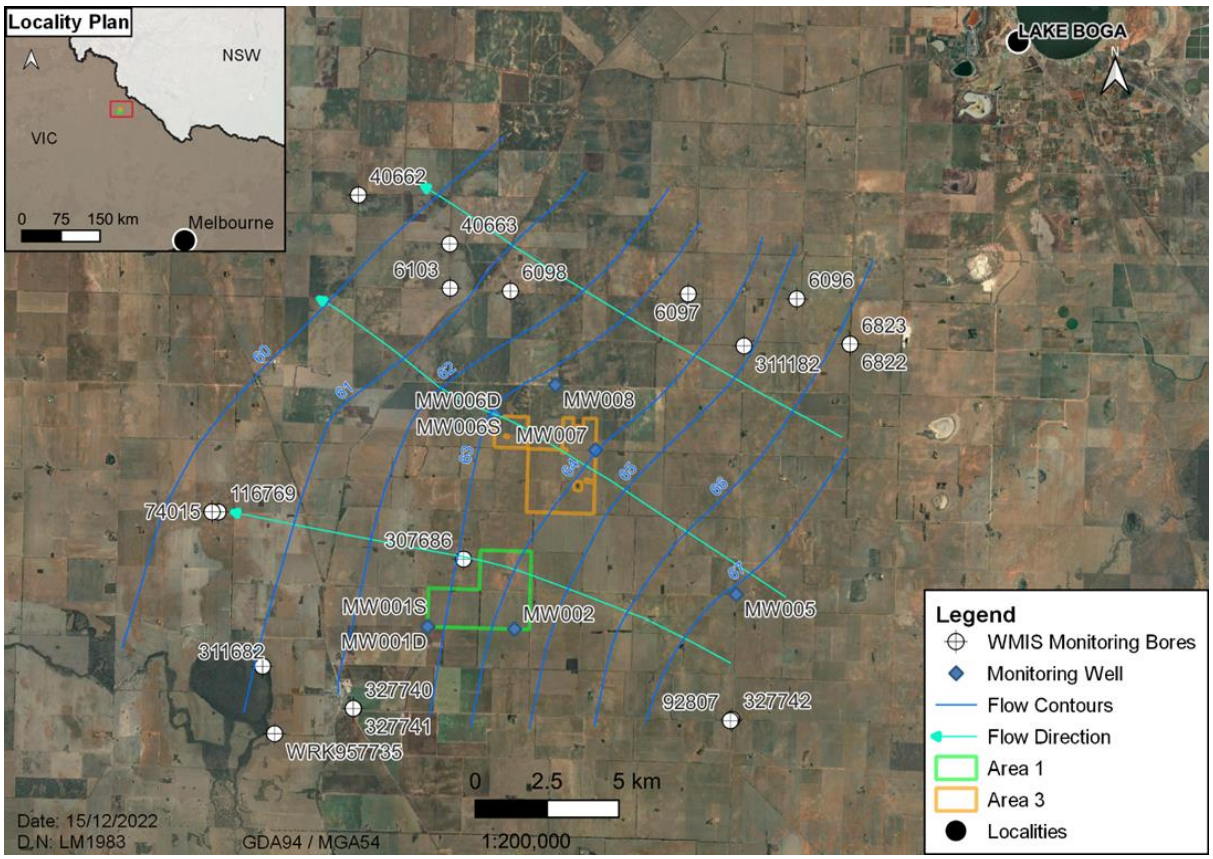


Figure 8 Inferred groundwater flow direction

4.5.4. Hydraulic gradients

Groundwater levels range from a high of 67.1 m AHD at monitoring bore MW005 to the east of the Project area, to a low of 59.31 m AHD north of the Project area. The groundwater contours presented in Figure 8 show a steady groundwater elevation decline to the northwest at an average gradient of 0.0004, which equates to 7 metres vertically and 17 km horizontally. The low hydraulic gradient suggests low groundwater recharge to the underlying Loxton Parilla Sands aquifer, as is also indicated by a lack of groundwater mounding and relatively low local rainfall.

A positive vertical hydraulic gradient was calculated using the difference in groundwater elevations at nested bores MW001S (Loxton Parilla Sands) and MW001D (Renmark Group). A positive vertical hydraulic gradient indicates that there is a low potential of leakage from the Loxton Parilla Sands aquifer to the underlying Renmark Group aquifer. This is demonstrated by the greater groundwater elevations, and therefore hydraulic head, identified in MW001D and MW006D in comparison to MW001S and MW006S.

4.5.5. Hydraulic conductivity

Hydraulic conductivity is a measure of how easily groundwater can pass through soil or rock. Higher hydraulic conductivities indicate that groundwater has a greater ability to pass through a particular rock, while lower hydraulic conductivities indicate that the rock is less permeable. A slug testing program was undertaken as part of field assessments in August and September 2021 to measure hydraulic conductivity within the Project area. Results of the slug testing indicated that the Loxton Parilla Sands generally demonstrated relatively higher hydraulic conductivities, with estimates ranging from 0.02 to 0.3 65 m/day. Hydraulic conductivities within the Renmark Group were lower and ranged from 0.006 to 0.15 m/day.

4.5.6. Groundwater recharge and discharge

The primary mechanism of groundwater recharge in the study area is via rainfall infiltration. Considering that the inferred depth to groundwater at the proposed mining locations is approximately 48 m bgl, groundwater recharge via rainfall infiltration is considered to be low.

The primary mechanism of groundwater discharge is related to groundwater throughflow to the northwest of the project area. Groundwater discharge is likely to outfall at the Murray River floodplain, with localised areas of discharge restricted to areas where groundwater occurs at elevations that intersect the ground surface. Lake Tyrell, Lake Wahpool and Lake Tiboram, located 55 km to the northwest, are known groundwater discharge features in the region.

There are no known permanent surface expressions of groundwater within 10 km of the proposed Project area. These might include springs or seeps. Major watercourses in the area such as Lalbert Creek, Tyrell Creek and Avoca River are typically disconnected from groundwater.

4.5.7. Groundwater chemistry

Groundwater data collected during field assessments indicated that groundwater salinity, as total dissolved solids (TDS) ranged from 13,394 to 29,565 mg/L across the project area in the Loxton Parilla Sands aquifer. Groundwater salinity is slightly less in the Renmark Group aquifer, as indicated by a TDS of 13,432 and 13,394 mg/L in MW001D and MW006D, respectively.

Groundwater quality was assessed as part of the groundwater monitoring events undertaken in August/September 2021 and April 2022. pH within the Loxton Parilla Sands was lower than expected for a saline, bicarbonate rich water. Naturally occurring metals such as iron and manganese were reported above the laboratory limit of reporting (LOR) within the groundwater and likely contribute to the acidity within the Loxton Parilla Sands aquifer. Low dissolved oxygen levels within the aquifer suggest that it is dysaerobic to anaerobic. These conditions are suitable for the presence of anaerobic bacteria communities containing species within the sulfate reducing bacteria and/ or iron oxidising bacteria class.

4.5.8. Environmental values

Environmental values refer to the uses, attributes and functions of the environment that Victorians value and is the key instrument in shaping the protection of water resources in the environment under the EP Act. For groundwater, environmental values are determined by its salinity.

Given that the average TDS of the groundwater in the Loxton Parilla Sands exceeds 10,000 mg/L and in accordance with the Environment Reference Standard (ERS), the environmental values that apply to groundwater in the Project area include:

- Water dependent ecosystems and species.
- Water based recreation - primary contact recreation.
- Traditional Owner cultural values.
- Buildings and structures.
- Geothermal properties.

Risk of harm to environmental values associated with geothermal properties, buildings and structures, water based recreation - primary contact recreation and Traditional owner cultural values are unlikely to be realised for the Project area for the following reasons:

- No geothermal properties were identified for groundwater in the Project area. This is due to the absence of geothermal activity in the Project area and groundwater measurements indicating that temperature ranges between approximately 16°C and 23°C.
- Given the depth to groundwater, no buildings and structures would intersect groundwater levels in the Project area.
- No water based recreation have been identified for groundwater in the Project area.
- Groundwater discharge is likely to occur a considerable distance from the Project area at Lake Tyrell, Lake Wahpool and Lake Tiboram some 55 km to the northwest.
- No specific cultural and spiritual values have been identified for groundwater in the Project area.

Risk of harm to environmental values associated with water dependent ecosystems and species are also unlikely to be realised in the Project area. A search of the Bureau of Meteorology (BoM) groundwater dependent ecosystems (GDE) Atlas showed no high-potential GDE types within 10 km of

the Project area. Smaller wetland features exist between the Project area and Lake Lalbert, located approximately 5 km to the west and between the Project area and the Avoca Marshes, approximately 10 km to the east. These features are located in areas where the depth to groundwater is likely to be greater than 10 m bgl and is considered highly saline, ranging from 13,000 to >35,000 mg/L TDS.

Groundwater fauna, such as stygofauna are found across a range of groundwater conditions but are most common in fresh and brackish groundwater and in aquifers with large pore spaces. Field investigations have suggested that the Loxton Parilla Sands aquifer has small or limited pore space and combined with the high groundwater salinity, it is considered unlikely that the aquifer environment is suitable for groundwater fauna.

Lake Lalbert and Lalbert Creek are Directory of Important Wetlands in Australia (DIWA) listed wetlands and are approximately 8 km west of the Project. Lake Lalbert has been dry since 1998. The groundwater table at Lake Lalbert is greater than 20 m bgl and is highly saline. Therefore, groundwater is not expected to contribute to surface water in the lake, or to the wetlands associated with Lalbert Creek.

The Kerang Wetlands are Directory of Important Wetlands in Australia (DIWA) and Ramsar (internationally important) wetlands located approximately 26 km east of the Project area. Given that groundwater flow from the Project area is to the northwest, there is limited groundwater interaction with potential groundwater ecosystems associated with the Kerang Wetlands, located 26 km up hydraulic gradient.

While risk of harm to the aforementioned environmental values may not be realised in the Project area, groundwater is still considered an environment that must be protected and all relevant environmental values are considered to apply at all times. This is consistent with the General Environmental Duty (GED) under the *Environment Protection Act 2017* (EP Act). Central to the EP Act is the GED. The GED is an ongoing duty to prevent the risk of harm to human health and the environment. According to Section 25(1) of the EP Act, the GED requires that a person or entity who is engaging in an activity that may give rise to risks of harm to human health or the environment, to minimise those risks, so far as reasonably practicable.

When determining what is reasonably practicable, Section 6(2) of the EP Act gives regard to the following:

- The likelihood of those risks eventuating.
- The degree of harm that would result if those risks eventuated.
- What a person concerned knows, or ought reasonably to know.
- The availability and sustainability of ways to eliminate or reduce risks.
- The cost of eliminating or reducing risks.

Satisfaction of the GED requires a proactive approach to risk identification, assessment and the implementation of controls to minimise impacts to human health and the environment so far as is reasonably practicable.

Summary

Given that treated effluent, mixed with process water, would ultimately form part of the tailings that would be deposited on-site within empty mining pits, risk of harm to the groundwater environment from the reuse scheme has been considered as part of this HEMP.

This HEMP does not cover broader impacts to groundwater, beyond the proposed reuse scheme, such as from mineral processing and tailings deposition. These impacts have been discussed as part of the Project EES and it is noted that an A18 permission would be prepared for the disposal of tailings in-pit during mining operations.

Where relevant, mitigation and monitoring measures have been proposed to minimise the potential impact to the groundwater environment. These have been discussed in Section 7.

4.6. Climate

Daily rainfall and pan evaporation data is available from the Bureau of Meteorology (BoM) Station ID 77021 at Lake Boga (Kunat), located approximately 10 km northeast of the Project. Mean annual minimum and maximum temperatures range between 9.4 and 24.0°C. Average annual rainfall and evaporation in the area is around 320 mm and 1620 mm, respectively. The Project experiences a relatively dry climate, where average monthly rates of rainfall are exceeded by evaporation in all months of the year (refer to Figure 9 below).

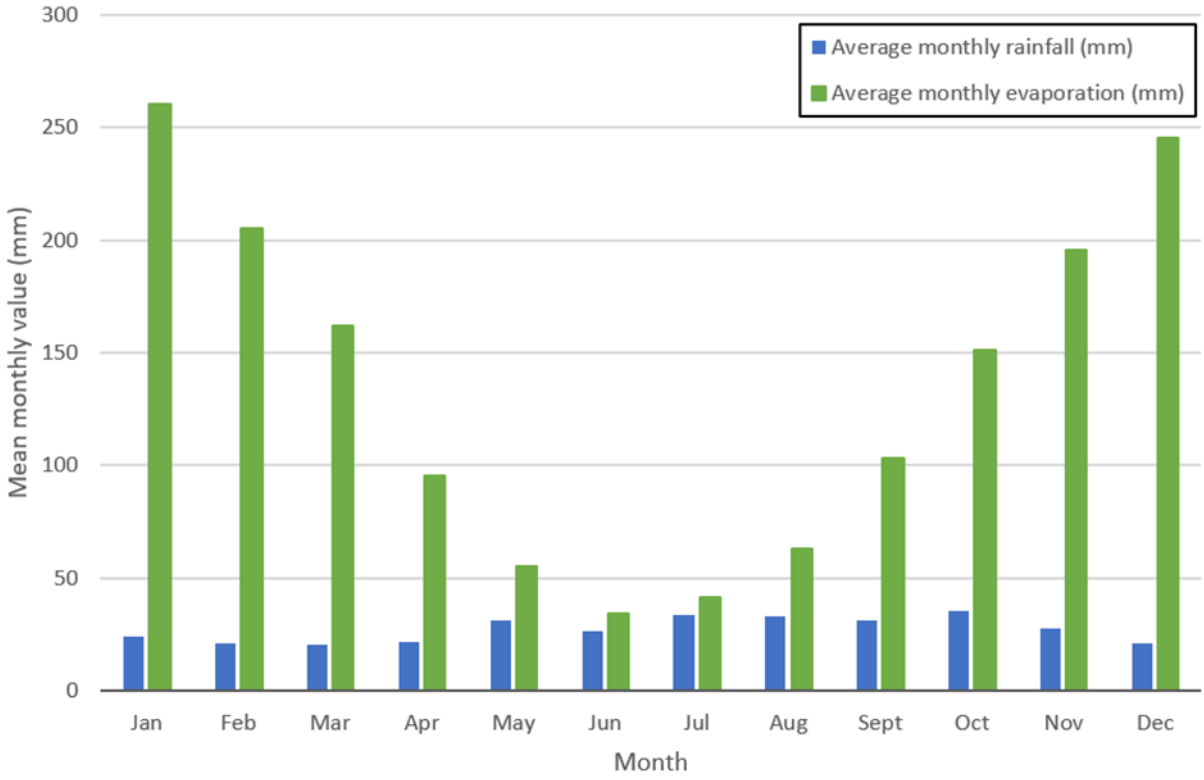


Figure 9 Average monthly rainfall and evaporation data (1933 to 2022), Lake Boga (Kunat) (ID 77021)

Summary

As part of the proposed reuse scheme, no treated effluent would be discharged to surface.

5. Hazard identification

Risks have been assessed according to EPA Publication 1911: *Technical information for the Victorian guideline for water recycling* (March, 2021), Table 21 (refer to Figure 10).

Table 21 – Qualitative risk matrix for estimating human health and environmental risks based on the likelihood of exposure or an event and the impact

		Impact descriptors				
Health		No negative impact	Minor impact for small population	Minor impact for large population	Major impact for small population	Major impact for large population
Environment [A]		No negative impact	Harmful to local ecosystem with local impacts contained to site	Harmful to regional ecosystem with local impacts primarily contained to on-site	Lethal to local ecosystem; pre-dominantly local, but potential for off-site impacts	Lethal to regional ecosystem or threatened species; wide-spread on-site and off-site impacts
Likelihood		Impact level				
Descriptor	**Level**	**1 Insignificant**	**2 Minor**	**3 Moderate**	**4 Major**	**5 Catastrophic**
1:100 years	A Rare	Low	Low	Low	Moderate	High
1:20 years	B Unlikely	Low	Low	Moderate	High	High
1:5 to 10 years	C Possible	Low	Moderate	High	High	Very high
1:1 to 4 years	D Likely	Low	Moderate	High	Very high	Very high
>1:1 year	E Almost certain	Low	Moderate	High	Very high	Very high

Figure 10 Qualitative risk matrix (EPA Publication 1911)

5.1. Qualitative risk assessment

The qualitative risk matrix for this reuse scheme is presented in Table 6 below based on the current understanding of the Project. A discussion of key hazards and mitigation measures are presented in Section 6 and Section 7.

Table 6 Qualitative risk matrix

Hazard	Summary of management measures	Likelihood	Impact	Risk level
Human health				
Exposure to on-site workers	• Engineering: contained system from treatment plant to point of mixing with process water circuit: PWP. • Employee training • Signage • Maintenance • Monitoring and testing • Incident response	Unlikely	Minor	Low
Inappropriate use of recycled water	• Engineering: single pipe system from treatment plant to point of mixing with process water circuit: PWP. • Employee training • Monitoring and testing	Unlikely	Minor	Low
Cross connection with potable water	• Engineering: single pipe system from treatment plant to point of mixing with process water circuit: PWP • Employee training • Maintenance	Rare	Minor	Low
Environment				
Odour impacts to off-site residents	• Engineering: sealed containment treatment tanks • Review re-use scheme in response to any odour complaints	Unlikely	Minor	Low
Impacts to groundwater quality	• Implement measures to minimise seepage losses to groundwater as much as practicable. • Undertake biannual groundwater monitoring	Almost certain	Minor	Moderate

6. Health management plan

Key human health hazards identified as part of the proposed reuse scheme include exposure to on-site workers, the inappropriate use of recycled water and cross connection with potable water. Given that the proposed reuse scheme involves using recycled water within a closed, industrial system and given that the recycled water would make up approximately 0.5% of the total processing water, human health risk levels are considered to be low.

Nonetheless, key management measures to ensure risks remain low through the operation of the reuse scheme are outlined below. These measures would be in accordance with the *Occupational Health and Safety Act 2004* and *Occupational Health and Safety Regulations 2017* as necessary.

6.1. Employee training

All on-site workers that have the potential to be exposed to the recycled water scheme would be provided with relevant training and guidance in order to manage human health risks. Training may include:

- The intended use of recycled water.
- Hygiene practices.
- Incident response.

It would be clear to employees how recycled water is used on-site, the hygiene practices that should be maintained on site and what to do in the event of the unintended release of recycled water, or in the event of human exposure to recycled water.

Employees would also be supported by a number of services, such as on-site first aid if required and technicians with expertise in the sewage system and its plumbing.

Training should be offered to employees at regular intervals to ensure that the necessary knowledge and awareness is maintained, and it is the responsibility of the water supplier and scheme manager to identify training needs, ensure that the right resources are available, that the necessary training is undertaken and that the necessary level of documentation is maintained.

Employee training would be managed as part of the mine site's Work Plan.

6.2. Signage

The appropriate use of signage and barries would be implemented, where required, to communicate the risks associated with the reuse scheme and to restrict access where recycled water is used. These should be implemented and managed by the water supplier and scheme manager.

6.3. Maintenance

Routine maintenance would be carried out by suitably qualified technicians. This would minimise the risks associated with the unintended release and / or use of recycled water on-site. Regular inspections would also be carried out as part of the operation of the mine.

Maintenance of the sewage treatment plant and any associated fittings and infrastructure would be managed as part of the mine site's Work Plan.

Further detail is provided in Section 8.

6.4. Monitoring and testing

Routine monitoring and testing would be carried out to ensure that the quality of the Class C recycled water is maintained during operations. It would be the responsibility of the water supplier and scheme manager to ensure that routine monitoring and testing is carried out and this would be managed as part of the mine site's Work Plan.

In the event that the recycled water does not meet Class C standards for its intended use, review and troubleshooting of the treatment system should be undertaken and reuse of recycled water should

cease until it is of sufficient quality for reuse within the mineral processing plant (refer to the water quality objectives in Table 1).

Further detail is provided in Section 11.

6.5. Incident response

Incident response associated with the reuse scheme would be captured as part of the mine site's Work Plan. Appropriate incident response is necessary to manage potential human health risks.

A summary of potential human health incidents and responses is provided in Table 7 below.

Table 7 Incident responses

Incident	Response
Recycled water does not meet Class C quality requirements	• Review and troubleshoot the treatment system. • Cease reuse of treated effluent until Class C water quality objectives are achieved.
Unintended release or spill	• Ensure that employees are evacuated from the spill area as required. • Ensure that the spill is cleaned up by suitably qualified personnel. • Where there is a release to the environment, notify EPA within 24 hours.
Employee illness from exposure or ingestion of recycled water	• Seek on-site first aid. • Contact local doctor or hospital for medical advice.

Further detail is provided in Section 10.

7. Environmental management plan

Key environmental hazards identified as part of the proposed reuse scheme include odour emissions and changes to groundwater chemistry. Recycled water from the sewage treatment plant would be mixed with raw water from Kangaroo Lake and used as part of mineral processing. The Project proposes to deposit tailings on-site within mined voids following the extraction and processing of minerals. Tailings would be deposited in-pit and backfilled with overburden and topsoil during the progressive rehabilitation of the mine site. While tailings would be dewatered prior to being deposited in-pit, residual tailings water would seep into the groundwater following deposition of the tailings in-pit. A negligible percentage of this seepage would be recycled water from sewage treatment.

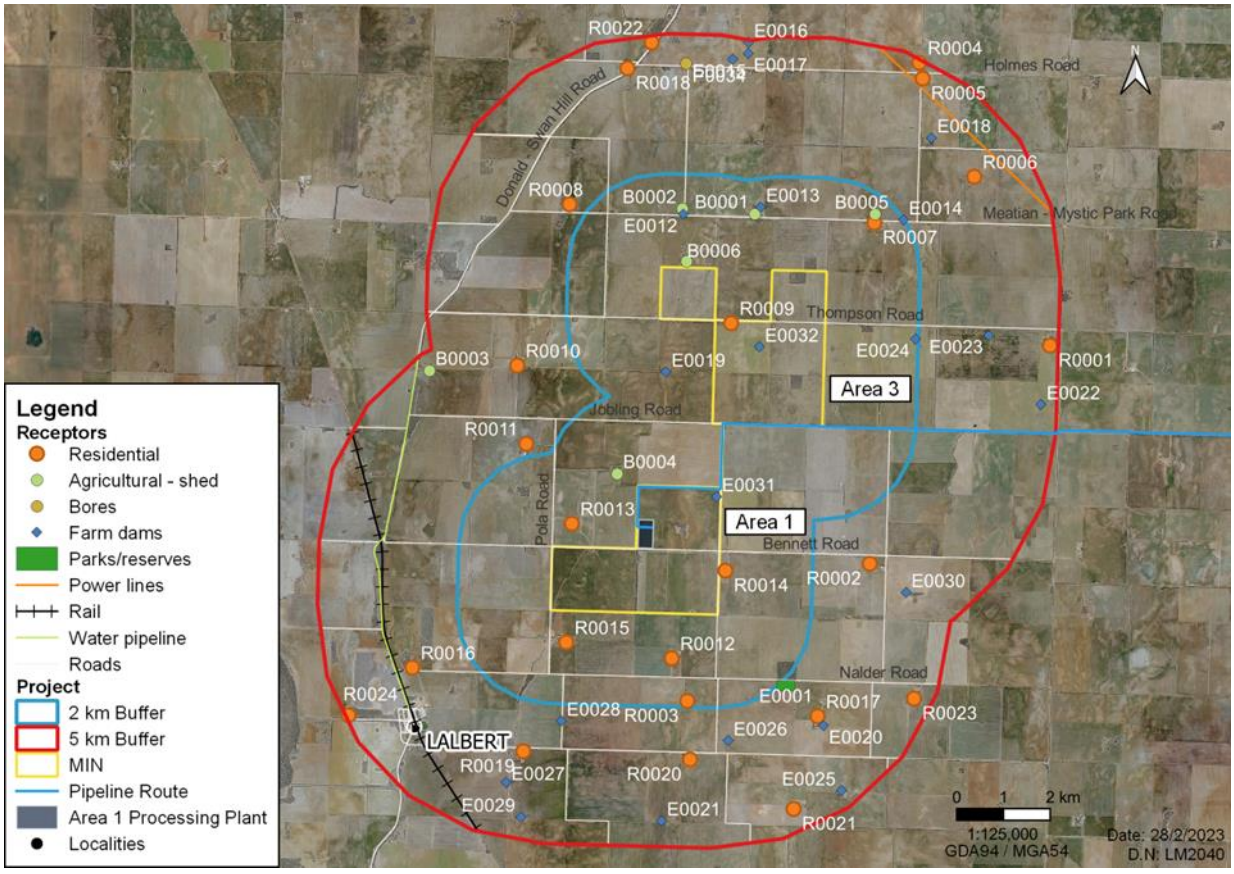
Subsequently, the risk associated with odour emissions is considered to be low, given that recycled water would be used within a closed, industrial process and would ultimately be deposited below ground level. There is a moderate risk associated with changes to groundwater quality, driven by a almost certain likelihood of tailings water seeping into groundwater.

To ensure that risks to the environment from the reuse of Class C recycled water are low, the following management measures are proposed.

7.1. Odour emissions

A number of sensitive receptors surround the Project mine sites. The nearest resident (R0013) is approximately 0.6 km north-west of the processing plant (refer to Figure 11).

Figure 11 Nearby sensitive receptors



EPA Publication 1518: *Recommended separation distance for industrial residual air emissions* (EPA, 2013) and draft EPA Publication 1949: *Separation distance Guideline* (EPA, 2022) both provide the same separation distance for odour emissions from wastewater treatment plants based on the size of the population they serve. The maximum separation distance depending on the type of installation for a Site population is 316 m.

While the sewage treatment plant would consist of sealed containment tanks and while recycled water would be used within a closed, industrial process, the recycled water supplier and scheme manager would be responsible for any odour complaints received in the unlikely event that odour emissions impact nearby receptors. The reuse scheme should be reviewed as necessary in response to any odour complaints received.

7.2. Groundwater quality

Measures to minimise the infiltration of groundwater would be implemented to minimise potential changes to groundwater quality. During operation of the Project, tailings water recovery would be optimised as much as practicable to minimise seepage to groundwater. Measures to optimise tailings water recovery would include, thickening during processing, decant on tailings to recover water, solar drying prior to backfill and the inclusion of an in-pit underdrain. These measures would be captured in a tailings management plan.

Additionally, a groundwater monitoring program would be developed to monitor groundwater quality in the Project area. Bi-annual groundwater monitoring is currently scheduled for a period of two years to develop a pre-mining baseline database for groundwater. During mining operations and rehabilitation, groundwater monitoring is proposed to continue bi-annually. Any changes to groundwater quality due to tailings leachate would be compared against the baseline database. If the ongoing groundwater monitoring detects any impacts to groundwater quality, a review of the groundwater data and mining practices would be undertaken. Groundwater monitoring details would be captured as part of a site groundwater management plan.

8. Managing the supply system

The sewage treatment plant and reuse scheme would conform with the relevant Australian and New Zealand standards and codes, namely:

- AS 1546.3:2017, On-site domestic wastewater treatment units, Part 3: Secondary treatment systems
- AS/NZS 3500, Plumbing and drainage
- Water supply code of Australia
- Plumbing Regulations 2018
- National Construction Code Volume Three: Plumbing Code of Australia

This would ensure that the system is designed, constructed and installed to the appropriate standards, the system is installed by a suitable qualified plumber, the use of recycled water is fit for purpose, maintenance and inspections are undertaken as appropriate and that monitoring and testing is undertaken as appropriate.

Key design requirements for the supply system include:

- A contained, single pipe system from sewage treatment plant to point of mixing with process water
- Separate above-ground recycled water and drinking water infrastructure by at least 100 mm
- Separate below-ground recycled water and drinking water infrastructure by at least 300 mm
- Use of purple identification tape for all below-ground recycled water pipes
- All outdoor recycled water taps would be coloured purple
- Recycled water taps would not be interchangeable with drinking water taps.

Standard operating procedures would be developed by the recycled water supplier, scheme manager and user as appropriate in order to manage the water supply system. This would be completed prior to implementation of the Project. These documents would be regularly reviewed and updated.

9. Community awareness

A Community Engagement Plan (CEP) is part of the Work Plan[1] and stakeholder engagement would be managed in accordance with the CEP for all activities that occur within the MIN, including the use of treated effluent. The CEP outlines the consultation and communication strategy that will be undertaken to keep all stakeholders informed during the various phases of Project development.

The CEP describes the methods VHM will use to engage stakeholders, outlines how individuals can obtain information and how people can raise concerns or provide feedback.

The aims and objectives of this community engagement plan will be implemented by:

- Identifying different stakeholder groups and designing consultation to meet their needs and expectations.
- Clarifying roles and responsibilities for community and stakeholder engagement to ensure consistency of approach and that stakeholders have accessible points of contact.
- Establishing systems and processes to support stakeholder engagement activities.
- Making sufficient investment in stakeholder engagement to ensure comprehensive and inclusive engagement.
- Providing opportunities for involving and communicating with stakeholders, ensuring open, transparent, timely and informed engagement occurs.

[1] Required under the *Mineral Resources (Sustainable development) Act 1990*

- Providing a process by which project planning can consider matters raised by stakeholders at the earliest possible stage.
- Reducing the potential for stakeholder dissatisfaction due to misunderstandings about the Project or the engagement process.

10. Emergency response

An Emergency Management Plan is part of the formal Work Plan Risk Management Plan (RMP).

The Emergency Management Plan includes detailed emergency response protocols and responsibilities in the event of an emergency. Where necessary, these protocols would be developed in consultation with EPA and the relevant authorities.

11. Record keeping

Good record keeping will ensure that a safe, sustainable and complaint re-use scheme is maintained. Important records include (but are not limited to):

- Current version of HEMP
- Standard operating procedures
- Monitoring and testing results
- Construction reports
- Commissioning reports
- Inspection and maintenance reports
- Annual reports
- Audit reports
- Details of incidents and emergencies
- Community complaints.

A record management system would be established and would be managed as part of the mine site's Work Plan.

11.1. Auditing

An audit of the recycled water scheme should be conducted every five years by a suitably qualified person. This would ensure that the reuse scheme is meeting regulatory requirements, that the HEMP is compliant and that all relevant risks are adequately managed.

11.2. Reporting to EPA

In accordance with EPA Publication 1910, the following information would be made available to EPA upon request:

- An analysis of the monitoring data collected for managing environmental risks
- A summary of incidents and emergencies, including corrective actions
- A register of supplied reuse schemes, including quality, quantity and type of use
- A summary of audit outcomes.